CHARTBOOK ON PATIENT SAFETY

National Healthcare Quality and Disparities Report

AHRQ
Agency for Healthcare Research and Quality

NATIONAL HEALTHCARE QUALITY AND DISPARITIES REPORT PATIENT SAFETY CHARTBOOK

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CONTENTS

PATIENT SAFETY

This Patient Safety Chartbook is part of a family of documents and tools that support the *National Healthcare Quality and Disparities Report* (QDR). The QDR is an annual report to Congress mandated in the Healthcare Research and Quality Act of 1999 (P.L. 106-129). The QDR provides a comprehensive overview of the quality of healthcare received by the general U.S. population and disparities in care experienced by different racial and socioeconomic groups.

The purpose of the reports is to assess the performance of our healthcare system and to identify areas of strengths and weaknesses in the healthcare system along three main axes: access to healthcare, quality of healthcare, and QDR priorities.

The reports are based on more than 250 measures of quality and disparities covering a broad array of healthcare services and settings. Data generally cover 2000 through 2017. The reports are produced with the help of an Interagency Work Group led by the Agency for Healthcare Research and Quality (AHRQ) and submitted on behalf of the Secretary of Health and Human Services (HHS). To access the most recent QDR, including methodologies and measure lists, go to https://www.ahrq.gov/research/findings/nhqrdr/index.html.

Chartbooks Organized Around Six Priority Areas

1. Making care safer by reducing harm caused in the delivery of care.
2. Ensuring that each person and family is engaged as partners in their care.
3. Promoting effective communication and coordination of care.
4. Promoting the most effective prevention and treatment practices for the leading causes of mortality, starting with cardiovascular disease.
5. Working with communities to promote wide use of best practices to enable healthy living.
6. Making quality care more affordable for individuals, families, employers, and governments by developing and spreading new healthcare delivery models.

Patient Safety is one of the six national priorities identified by the QDR. AHRQ has identified three long-term goals related to patient safety: reduce preventable hospital admissions and readmissions, reduce the incidence of adverse healthcare-associated conditions, and reduce harm from inappropriate or unnecessary care.

This chartbook focuses on adverse healthcare-associated conditions and harm from inappropriate or unnecessary care. It also includes selected readmissions-related measures.

Preventable admissions and readmissions can result from problems with patient safety or problems with care coordination. We have chosen to include most measures of preventable admissions and readmissions in the Care Coordination chartbook. To access the most recent Care Coordination chartbook, go to https://www.ahrq.gov/research/findings/nhqrdr/chartbooks/carecoordination/index.html.

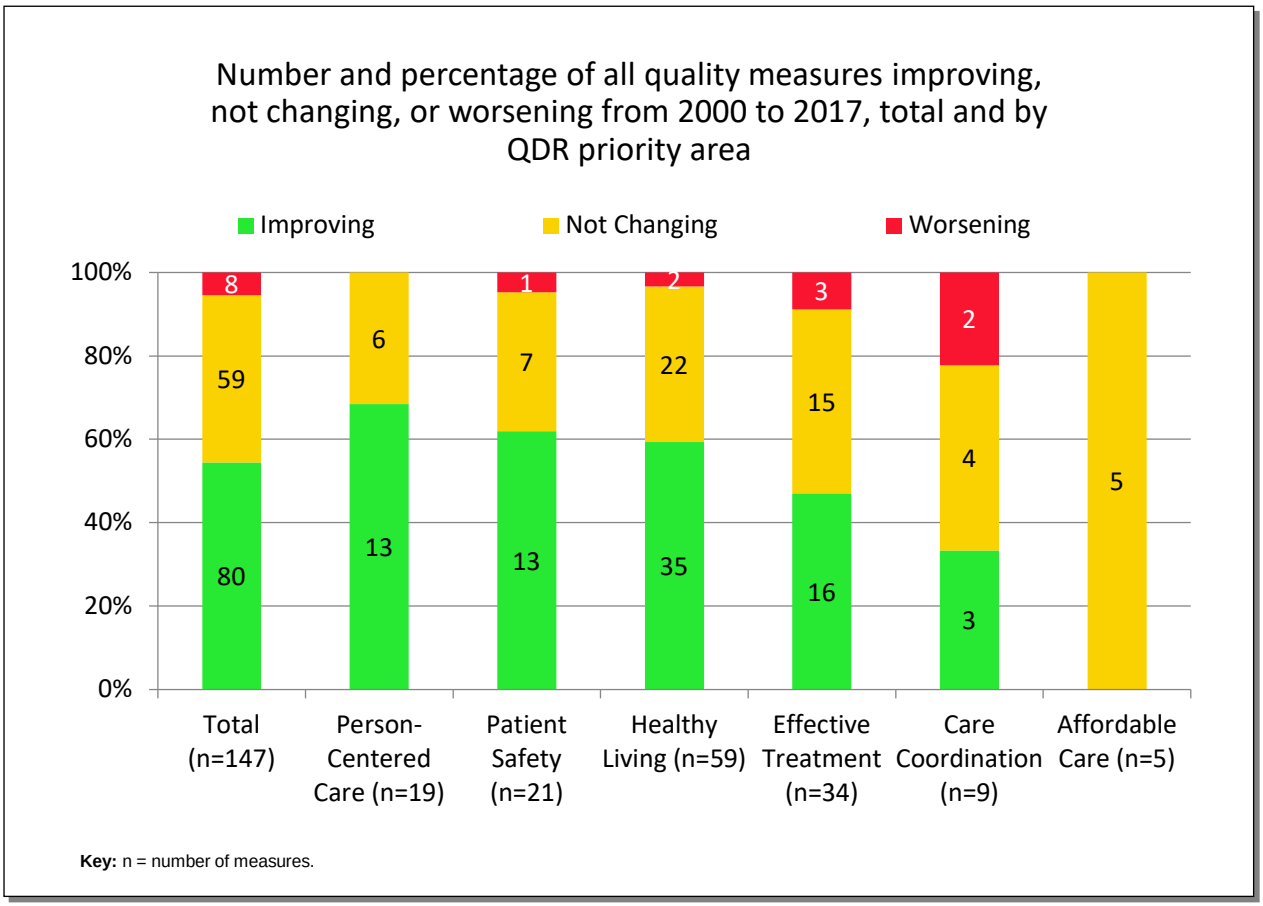
Chartbook Content

This chartbook includes:

- Summaries of trends across measures of patient safety from the QDR.
- Figures illustrating select measures of patient safety.
- Supplemental descriptions and data on patient safety measures from several outside sources.

Introduction and Methods contains information about methods used in the chartbook. A Data Query tool (http://nhqrnet.ahrq.gov/inhqrdr/data/query) provides access to most QDR data tables.

Summary of Trends Across QDR Priorities

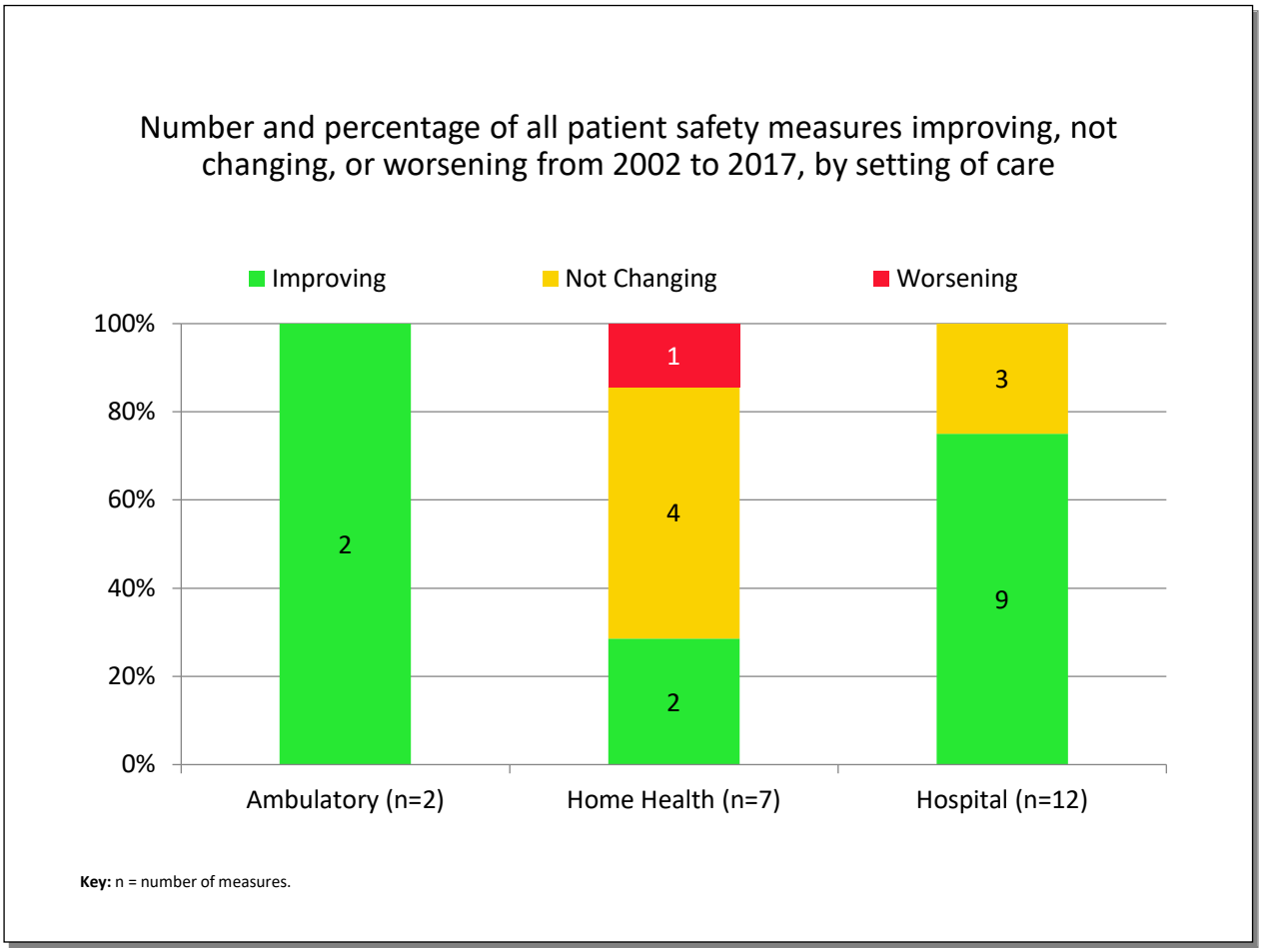


Note: For most measures in the 2017 QDR, trend data are available from 2000–2014 at the earliest to 2012–2017 at the latest. This chart is limited to those measures that had the minimum four data points that AHRQ requires to conduct a trend analysis. For each measure with at least four estimates over time, unweighted log-linear regression is used to calculate average annual percentage change and to assess statistical significance. Measures are aligned so that positive change indicates improved care.

- **Improving =** Rates of change are positive at 1% per year or greater and are statistically significant.
- **Not Changing** = Rate of change is less than 1% per year or is not statistically significant.
- **Worsening** = Rates of change are negative at -1% per year or greater and are statistically significant.

- Through 2017, across a broad spectrum of measures of healthcare quality, about 54% showed improvement (green).
- Person-Centered Care: More than two-thirds of person-centered care measures were improving overall.
- Patient Safety: Nearly two-thirds of patient safety measures were improving overall.
    - The one measure with worsening results was "Adults who reported a home health provider asking to see all the prescription and over-the-counter medicines they were taking, when they first started getting home health care."
- Healthy Living: More than half of healthy living measures were improving overall.
- Effective Treatment: Almost half of effective treatment measures were improving overall.
- Care Coordination: One-third of care coordination measures were improving overall.
- Affordable Care: No affordable care measures changed overall.
- Access measures are not represented on this chart. For more information, refer to the 2018 National Healthcare Quality and Disparities Report.

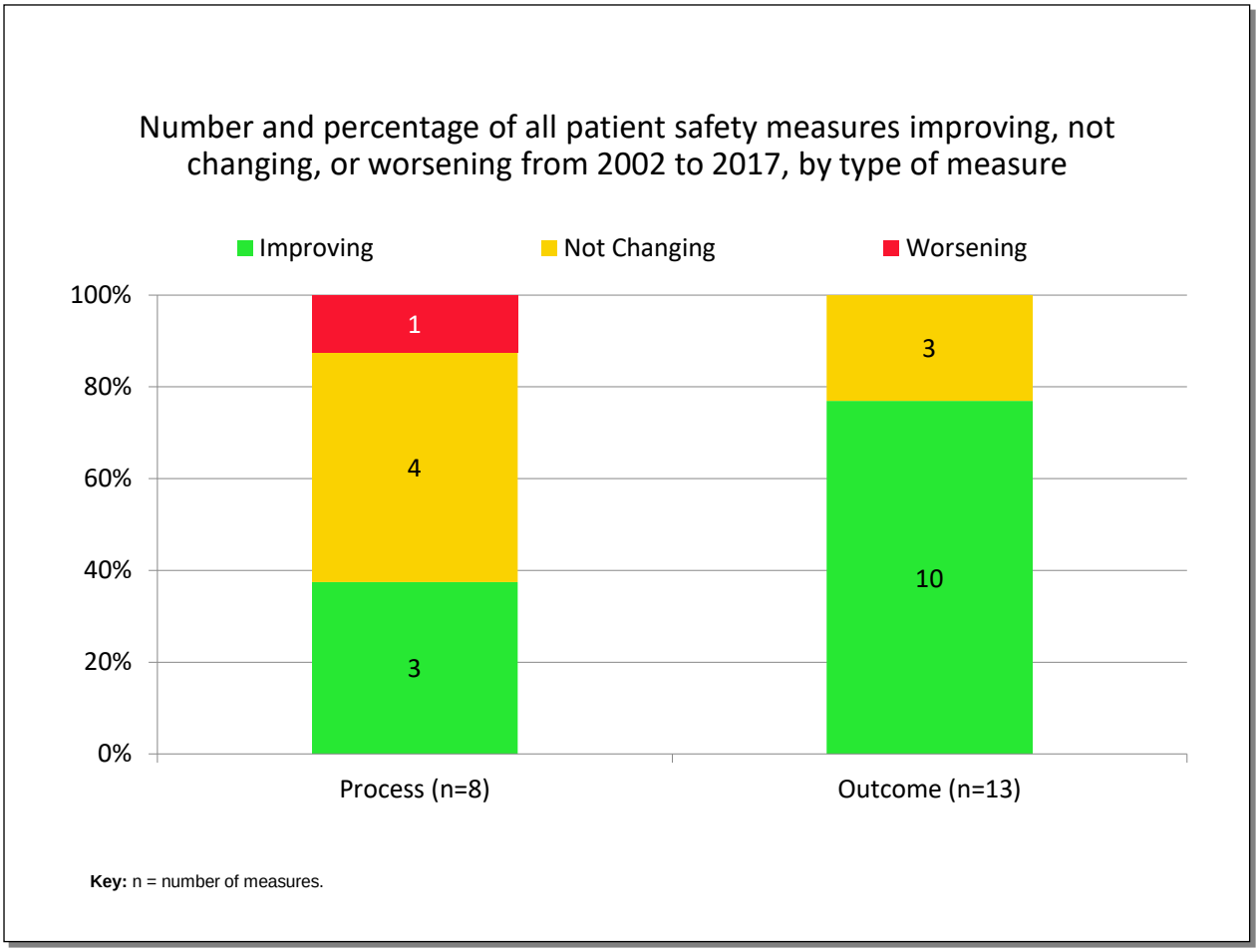
Summary of Trends by Setting of Care



- **Importance:** The chartbook is organized around setting of care; stratifying trends by care setting provides insight into which settings are exhibiting more or fewer measures improving.
- **Findings:**
  - Both ambulatory care measures and three-fourths of hospital measures are improving, compared with nearly 30% of home health measures.
  - The measure that is worsening is "Adults who reported a home health provider asking to see all the prescription and over-the-counter medicines they were taking when they first started getting home health care," which declined from 78.8% in 2012 to 77.1% in 2017.
- **Ambulatory Measures:**
  - Adults age 65 and over who received in the calendar year at least 1 of 11 prescription medications that should be avoided in older adults
  - Adults age 65 and over who received in the calendar year at least 1 of 33 potentially inappropriate prescription medications for older adults
- **Home Health Measures:**
  - Home health care patients whose management of oral medications improved
  - Adults who reported a home health provider talking with them when they first started getting home health care about how to set up their home so they can move around safely
  - Adults who reported that home health providers talked with them in the last 2 months of care about when to take medicines
  - Adult home health patients age 18 and over who reported that home health providers talked with them in the last 2 months of care about the side effects of medicines
  - Adults who reported a home health provider talking with them when they first started getting home health care about all the prescription and over-the-counter medicines they were taking
  - Adults who reported that home health providers talked with them about the purpose for taking their new or changed prescription medicines
  - Adults who reported a home health provider asking to see all the prescription and over-the-counter medicines they were taking when they first started getting home health care
- **Hospital Measures:**
  - Adult surgery patients with catheter-associated urinary tract infection
  - Adult surgery patients with postoperative pneumonia events
  - Inpatient adverse events in adults receiving hip joint replacement due to degenerative conditions
  - Inpatient adverse events in adults receiving hip joint replacement due to fracture
  - Inpatient adverse events in adults receiving knee replacement
  - Mechanical adverse events in adult patients receiving central venous catheter placement
  - Adverse drug event with IV heparin in adult hospital patients who received an anticoagulant

- Hospital patients with an anticoagulant-related adverse drug event to low-molecular-weight heparin (LMWH) or factor Xa inhibitor
- Hospital patients who received a hypoglycemic agent who had an adverse drug event with hypoglycemic agents
- Adult surgery patients with postoperative venous thromboembolic events
- Bloodstream infection in adult patients receiving central venous catheter placement
- Hospital patients with an anticoagulant-related adverse drug event to warfarin

Summary of Trends by Type of Measure



Key: n = number of measures.

- **Importance:** The ultimate goal of quality improvement is to produce better patient outcomes. Improvements in processes may or may not lead to patient outcomes. Are improvements in Patient Safety measures dominated by improvements in processes, or are outcomes also improving?

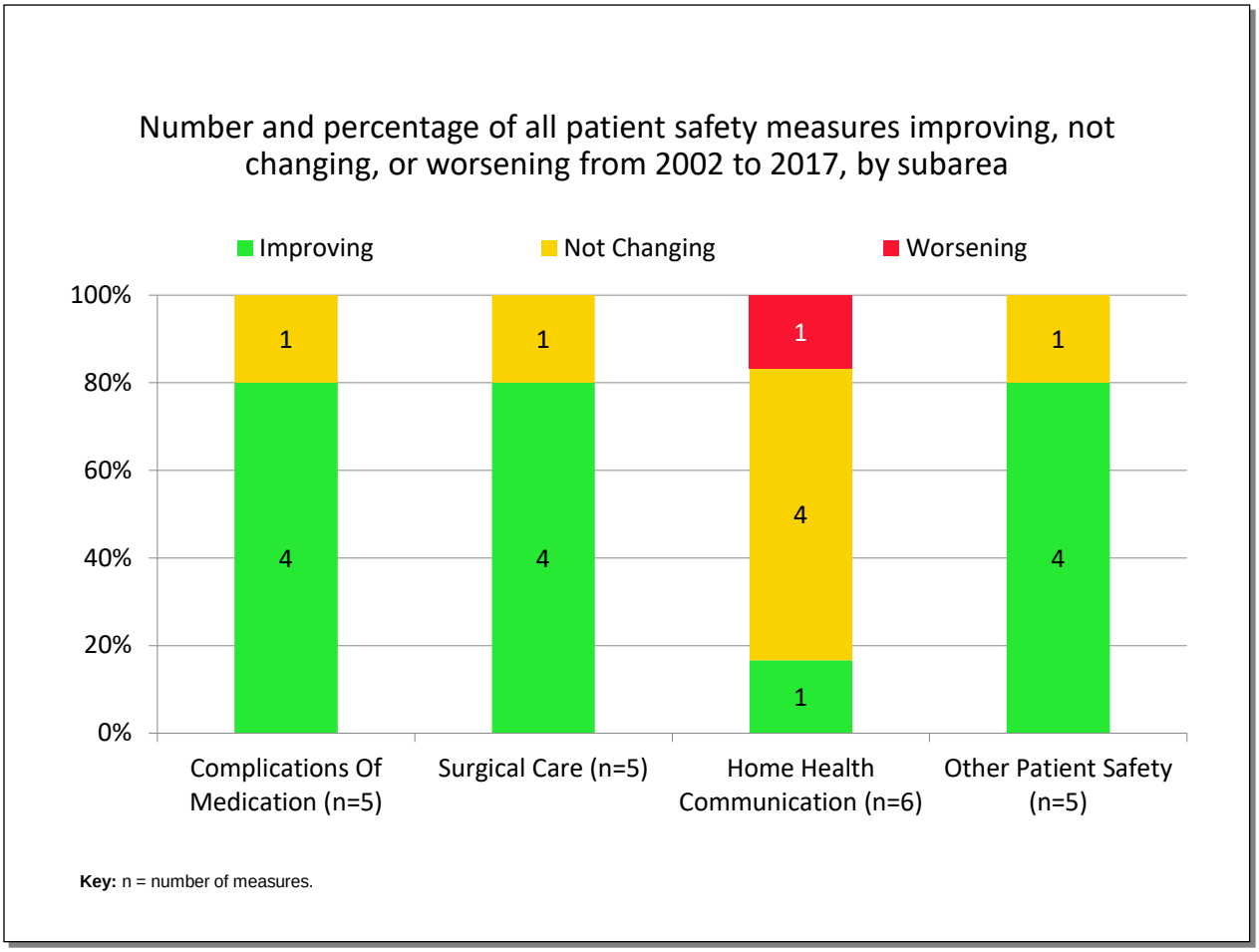
- **Findings:**
  - More than three-fourths (77%) of outcome measures improved, compared with only 37.5% of process measures. However, the outcomes are almost entirely hospital measures and the process measures are almost entirely home health measures.
  - The measure that is worsening is "Adults who reported a home health provider asking to see all the prescription and over-the-counter medicines they were taking when they first started getting home health care," which declined from 78.8% in 2012 to 77.1% in 2017.

- **Process Measures:**
  - Adults age 65 and over who received in the calendar year at least 1 of 11 prescription medications that should be avoided in older adults
  - Adults age 65 and over who received in the calendar year at least 1 of 33 potentially inappropriate prescription medications for older adults
  - Adult home health patients age 18 and over who reported that home health providers talked with them about the side effects of medicines in the last 2 months of care
  - Adults who reported a home health provider talking with them when they first started getting home health care about all the prescription and over-the-counter medicines they were taking
  - Adults who reported that home health providers talked with them in the last 2 months of care about the purpose for taking their new or changed prescription medicines
  - Adults who reported a home health provider talking with them when they first started getting home health care about how to set up their home so they can move around safely
  - Adults who reported that home health providers talked with them in the last 2 months of care about when to take medicines
  - Adults who reported a home health provider asking to see all the prescription and over-the-counter medicines they were taking when they first started getting home health care

- **Outcome Measures:**
  - Home health care patients whose management of oral medications improved
  - Adult surgery patients with catheter-associated urinary tract infection
  - Adult surgery patients with postoperative pneumonia events
  - Inpatient adverse events in adults receiving hip joint replacement due to degenerative conditions
  - Inpatient adverse events in adults receiving hip joint replacement due to fracture
  - Inpatient adverse events in adults receiving knee replacement
  - Mechanical adverse events in adult patients receiving central venous catheter placement
  - Adverse drug events with IV heparin in adult hospital patients who received an anticoagulant
  - Hospital patients with an anticoagulant-related adverse drug event to low-molecular-weight heparin (LMWH) or factor Xa inhibitor
  - Hospital patients who received a hypoglycemic agent who had an adverse drug event with hypoglycemic agents

- Adult surgery patients with postoperative venous thromboembolic events
- Bloodstream infection in adult patients receiving central venous catheter placement
- Hospital patients with an anticoagulant-related adverse drug event to warfarin

Summary of Trends by Subarea



- **Importance**: Improvement is not concentrated in one aspect of care but is spread over multiple aspects of care.
- **Findings:**
  - Home Health Communication is the only area in which any measure is worsening and it is the only area where most measures (83%) are not improving.
  - The measure that is worsening is "Adults who reported a home health provider asking to see all the prescription and over-the-counter medicines they were taking when they first started getting home health care," which declined from 78.8% in 2012 to 77.1% in 2017.

- **Complications of Medication:**
  - Adverse drug events with IV heparin in adult hospital patients who received an anticoagulant
  - Hospital patients with an anticoagulant-related adverse drug event to low-molecular-weight heparin (LMWH) or factor Xa inhibitor
  - Hospital patients who received a hypoglycemic agent who had an adverse drug event with hypoglycemic agents
  - Home health care patients whose management of oral medications improved
  - Hospital patients with an anticoagulant-related adverse drug event to warfarin
- **Surgical Care:**
  - Adult surgery patients with postoperative pneumonia events
  - Inpatient adverse events in adults receiving hip joint replacement due to degenerative conditions
  - Inpatient adverse events in adults receiving hip joint replacement due to fracture
  - Inpatient adverse events in adults receiving knee replacement
  - Adult surgery patients with postoperative venous thromboembolic events
- **Home Health Communication:**
  - Adults who reported a home health provider talking with them when they first started getting home health care about how to set up their home so they can move around safely
  - Adults who reported a home health provider talking with them about all the prescription and over-the-counter medicines they were taking when they first started getting home health care
  - Adults who reported that home health providers talked with them in the last 2 months of care about the purpose for taking their new or changed prescription medicines
  - Adults who reported that home health providers talked with them in the last 2 months of care about when to take medicines
  - Adult home health patients age 18 and over who reported that home health providers talked with them in the last 2 months of care about the side effects of medicines
  - Adults who reported a home health provider asking to see all the prescription and over-the-counter medicines they were taking when they first started getting home health care
- **Other Patient Safety** (detailed subarea in parentheses):
  - Adult surgery patients with catheter-associated urinary tract infection (Healthcare-Associated Infections)
  - Adults age 65 and over who received in the calendar year at least 1 of 11 prescription medications that should be avoided in older adults (Inappropriate Treatment)
  - Adults age 65 and over who received in the calendar year at least 1 of 33 potentially inappropriate prescription medications for older adults (Inappropriate Treatment)

- Mechanical adverse events in adult patients receiving central venous catheter placement (Other Complications of Hospital Care)
- Bloodstream infection in adult patients receiving central venous catheter placement (Other Complications of Hospital Care)

Trends in Patient Safety Measures

Measures Improving

Through 2016 or 2017, overall, the four measures with the largest rate of improvement are:

- Inpatient adverse events in adults receiving knee replacement.
- Hospital patients with an anticoagulant-related adverse drug event to low-molecular-weight heparin (LMWH) or factor Xa inhibitor.
- Inpatient adverse events in adults receiving hip joint replacement due to degenerative conditions.
- Adult surgery patients with postoperative pneumonia events.

Additional improving measures ranked from largest to smallest rate of improvement are:

- Home health care patients whose management of oral medications improved.
- Inpatient adverse events in adults receiving hip joint replacement due to fracture.
- Hospital patients who received a hypoglycemic agent who had an adverse drug event with hypoglycemic agents.
- Adults age 65 and over who received in the calendar year at least 1 of 11 prescription medications that should be avoided in older adults.
- Adverse drug events with IV heparin in adult hospital patients who received an anticoagulant.
- Adult surgery patients with catheter-associated urinary tract infection.
- Adults age 65 and over who received in the calendar year at least 1 of 33 potentially inappropriate prescription medications for older adults.
- Mechanical adverse events in adult patients receiving central venous catheter placement.
- Adults who reported a home health provider talking with them when they first started getting home health care about how to set up their home so they can move around safely.

Measure years are from 2002, 2009, 2012, or 2013 through 2016 or 2017. Improving measures are defined as rates of change that are positive at 1% per year or greater and that are statistically significant. The measure of improvement is the average annual percentage change (APC); refer to the 2018 National Healthcare Quality and Disparities Report Introduction and Methods section for details on how the APC is measured.

Measures Not Changing

Through 2012, 2016, or 2017, overall, the four measures that were changing the least overall were all measures related to adverse drug events:

- Adults who reported a home health provider talking with them when they first started getting home health care about all the prescription and over-the-counter medicines they were taking
- Adult home health patients age 18 and over who reported that home health providers talked with them in the last 2 months of care about the side effects of medicines
- Adults who reported that home health providers talked with them in the last 2 months of care about the purpose for taking their new or changed prescription medicines
- Adults who reported that home health providers talked with them in the last 2 months of care about when to take medicines

Additional measures not changing over time are:

- Adult surgery patients with postoperative venous thromboembolic events.
- Hospital patients with an anticoagulant-related adverse drug event to warfarin.
- Bloodstream infection in adult patients receiving central venous catheter placement.

Measure years are from 2009 or 2012 through 2012, 2016, or 2017. Measures not changing are defined as rates of change that are less than 1% per year or are not statistically significant. The measures shown here had no statistically significant changes.

Measures Worsening

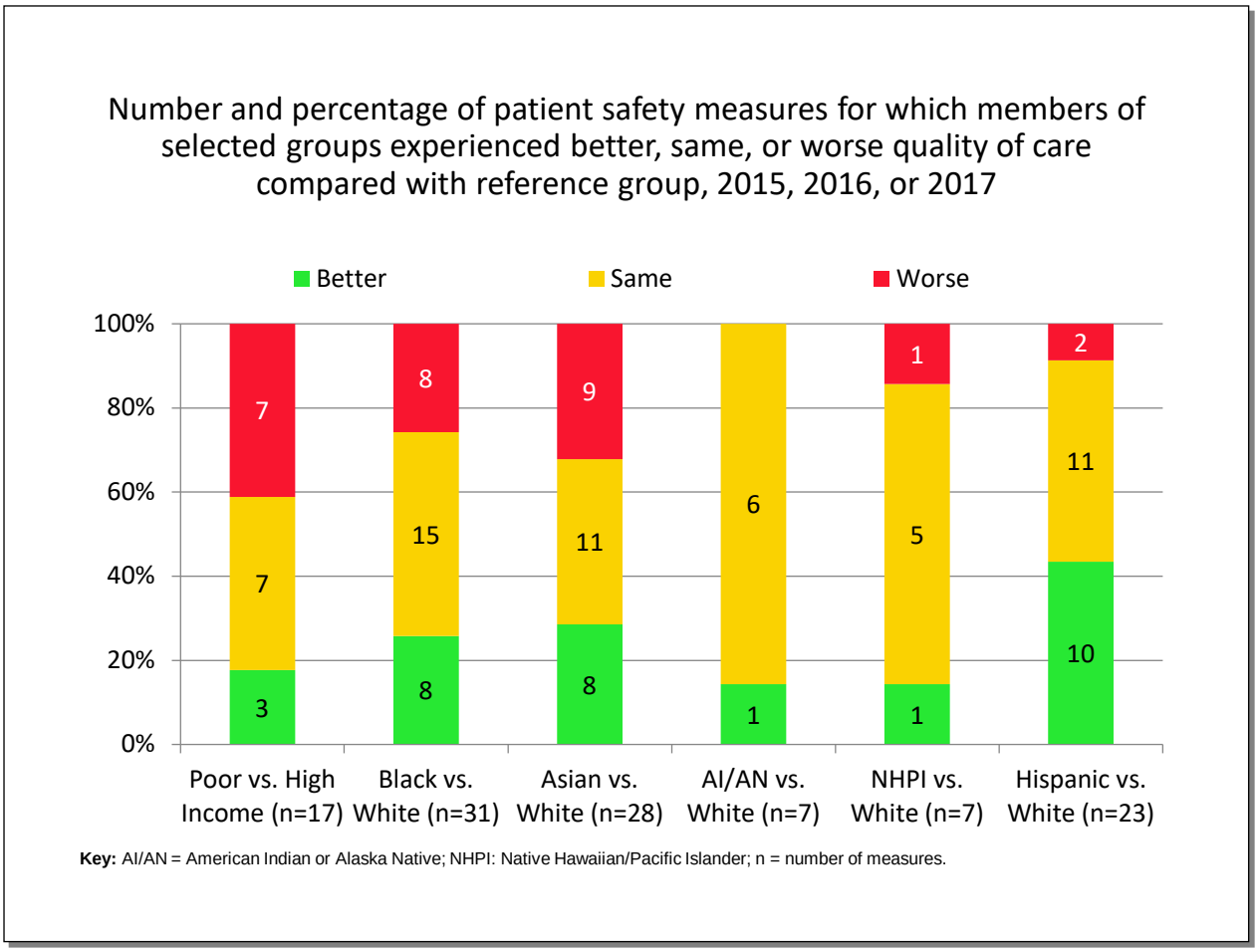
Through 2016 or 2017, overall, only one measure was worsening overall:

- Adults who reported a home health provider asking to see all the prescription and over-the-counter medicines they were taking when they first started getting home health care, which declined from 78.8% in 2012 to 77.1% in 2017.

Worsening measures are defined as rates of change that are negative at 1% per year or greater and that are statistically significant. Trend and disparity analyses of this Home Health Consumer Assessment of Healthcare Providers and Systems (HHCAHPS) survey measure, see "Home Health Providers Asking To See Patients' Medicines" below in the section on patient safety in home health care. CAHPS® is a registered trademark of the Agency for Healthcare Research and Quality.

No disparities were improving over time.

Disparities in Patient Safety



Note: Numbers of measures differ across groups in part because of data limitations. The measures shown here are from 2015 or later. This figure reflects the most current data year available and is not limited to measures that met the criteria for conducting trend analysis (i.e., may include fewer than four data points). The relative difference between a selected group and its reference group is used to assess disparities. Poor indicates family income less than the Federal poverty level. High Income indicates family income four times the Federal poverty level or greater.

- **Better** = Selected group received better quality of care than reference group. Differences are statistically significant, are equal to or larger than 10%, and favor the selected group.
- **Same** = Selected group and reference group received about the same quality of care. Differences are not statistically significant or are smaller than 10%.
- **Worse** = Selected group received worse quality of care than reference group. Differences are statistically significant, are equal to or larger than 10%, and favor the reference group.

- People in poor households received worse care than people in high-income households for just over 40% of patient safety measures.
- Blacks received worse care than Whites for about one-quarter of patient safety measures.
- Asians received worse care than Whites for nearly one-third of patient safety measures.
- AI/ANs did not receive worse care than Whites for any patient safety measure.
- NHPIs received worse care than Whites for one patient safety measure.
- Hispanics received worse care than Whites for almost 10% of patient safety measures.

Trends in Patient Safety Disparities

- One patient safety measure had worsening disparities over time:
  - Home health care patients whose management of oral medications improved
- Sixteen subgroup comparisons across 8 measures did not show any change over time, including:
  - **Race.** Black vs. White: Hospital patients who received a hypoglycemic agent who had an adverse drug event with hypoglycemic agents
  - **Age.** 65 years and over vs. 18-44 years: Adults who reported a home health provider asking to see all the prescription and over-the-counter medicines they were taking when they first started getting home health care
  - **Sex.** Female vs. Male: Adults age 65 and over who received in the calendar year at least 1 of 33 potentially inappropriate prescription medications for older adults

Measures of Patient Safety

Individual measures are presented by the setting in which care was provided:

- Hospitals
- Ambulatory care
- Infrastructure: nursing homes and community pharmacies

Select patient safety measure results are presented overall and by age, sex, race, ethnicity, health status, or presence of various health conditions.

Patient Safety in the Hospital Setting

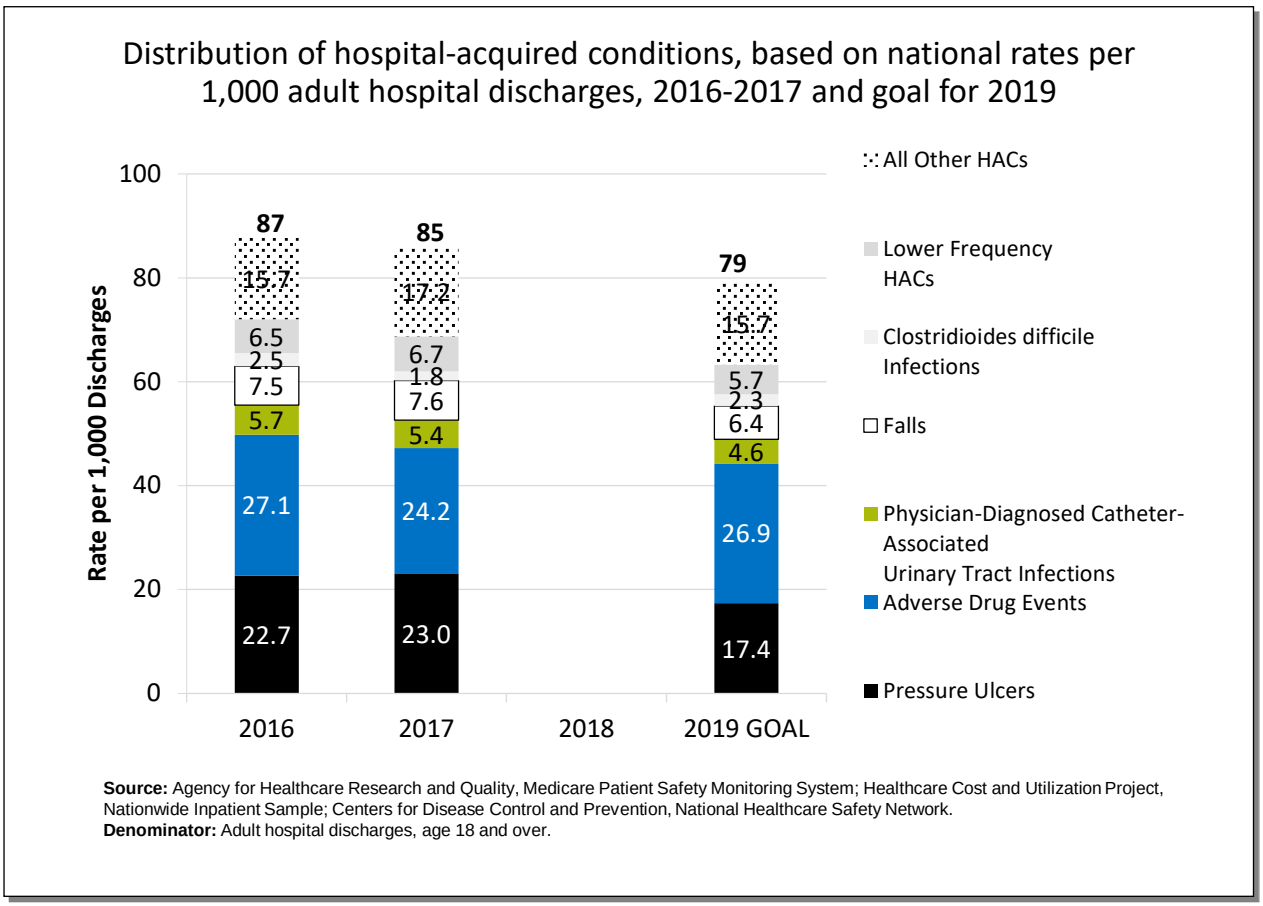
Hospitals are a common setting for patient safety events:

- Many patients admitted to the hospital are in a clinically compromised state.
- Care often includes the use of invasive devices and procedures, increasing patients' risk for infection and other harm.

Measures address:

- Overall hospital-acquired conditions (HACs).
- Healthcare-associated infections (HAIs).
- Procedure-related events.
- Readmissions and complications.
- Adverse drug events.

Hospital-Acquired Conditions



Source: Agency for Healthcare Research and Quality, Medicare Patient Safety Monitoring System; Healthcare Cost and Utilization Project, Nationwide Inpatient Sample; Centers for Disease Control and Prevention, National Healthcare Safety Network.
Denominator: Adult hospital discharges, age 18 and over.

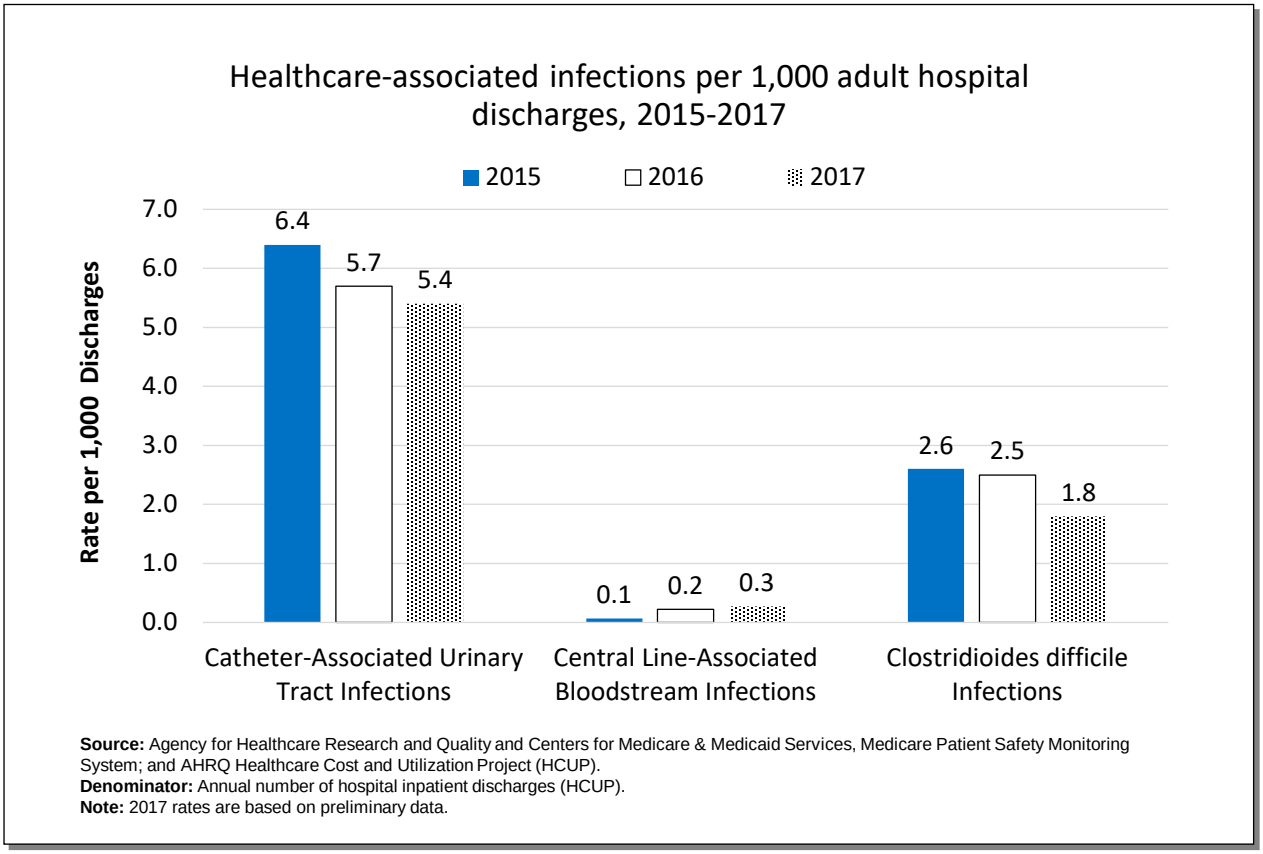
- In 2017, the following HACs met their 2019 goals (20% reduction from their 2014 baseline rates):
  - Adverse drug events
  - *Clostridioides difficile* (C. difficile) infections
- Lower frequency HACs (<3/1,000 discharges) include central line-associated bloodstream infections, venous thromboembolisms, surgical site infections, obstetric adverse events, and ventilator-associated pneumonia.
- The 2017 all other HACs include inadvertent femoral artery puncture for catheter angiographic procedures, adverse events associated with hip joint replacement, adverse events associated with knee joint replacement, contrast nephropathy associated with catheter angiography, methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococcus* (VRE), mechanical complications associated with central venous catheters, postoperative cardiac events for cardiac and noncardiac surgery, postoperative pneumonia, iatrogenic pneumothorax, postoperative hemorrhage or hematoma, postoperative respiratory failure, and accidental puncture or laceration.
- Data in this graph reflect interim results. Prior analysis suggests that the pending final data should be very similar.

- For more information on methods, refer to the AHRQ National Scorecard on Hospital-Acquired Conditions: Updated Baseline Rates and Preliminary Results 2014–2017 at https://www.ahrq.gov/professionals/quality-patient-safety/pfp/index.html.
- For general information on HACs and measurement, refer to Quality Measure Tools & Resources at https://www.ahrq.gov/professionals/quality-patient-safety/quality-resources/index.html.

Healthcare-Associated Infections

- Infections acquired during a hospital stay are among the most common complications of hospital care.[1]
- On any given day, about 1 in 31 hospital patients has at least one HAI.[2]
- HAIs often increase patients' length of stay in the hospital, risk of death, and hospital costs.
- New infections in critically ill infants, children, and other patients generally reduce their chances for recovery.
- For more information, refer to the HAI and Antibiotic Use Prevalence Survey at https://www.cdc.gov/hai/eip/antibiotic-use.html.

Rate of Healthcare-Associated Infections



Source: Agency for Healthcare Research and Quality and Centers for Medicare & Medicaid Services, Medicare Patient Safety Monitoring System; and AHRQ Healthcare Cost and Utilization Project (HCUP).
Denominator: Annual number of hospital inpatient discharges (HCUP).
Note: 2017 rates are based on preliminary data.

- For additional information on the data and methods used in calculating the rates shown in this figure, check the AHRQ National Scorecard on Hospital-Acquired Conditions: Updated Baseline Rates and Preliminary Results 2014–2017 at https://www.ahrq.gov/professionals/quality-patient-safety/pfp/index.html.

Standardized Infection Ratios

Standardized infection ratios (SIRs) compare the observed numbers of specific types of infections with the numbers of infections predicted. The predicted numbers are based on various healthcare facility and patient population characteristics. SIRs are calculated based on infections healthcare facilities report to the Centers for Disease Control and Prevention (CDC) National Healthcare Safety Network (NHSN) during a year.

- **Importance:** SIRs facilitate comparative evaluations of hospital risk-adjusted performance.
- **Methods:**
  - For various infections, CDC had previously used data from 2006-2011 to establish baseline predicted infection rates.
  - New baselines were recently established using 2015 data. Therefore, almost all 2015 national SIRs for various HAI types are very close to 1.0, and trends involving SIRs from previous years cannot be examined.
  - NHSN data had been predominantly from intensive care units, although general medical/surgical inpatient wards and other non-critical care locations are also increasingly represented. The numbers of units/facilities reporting to NHSN roughly quadrupled from 2009 to 2014.
  - Statewide SIRs with 95% confidence intervals entirely above 1.0 indicate that, on average, a given State's hospitals had more HAIs of a specific type than hospitals of similar type and size had reported during the baseline period. Conversely, statewide SIRs with 95% confidence intervals entirely below 1.0 indicate that the State's hospitals generally had fewer HAIs of that type than hospitals of similar type and size had reported during the baseline period. Statewide SIRs with 95% confidence intervals that included 1.0 indicated that their hospitals had roughly the same number of infections (e.g., catheter-associated urinary tract infections) as hospitals of similar type and size had reported during the referent period.
  - SIRs differ from the rates presented in "Healthcare-associated infections per 1,000 adult hospital discharges, 2015-2017" calculated from the MPSMS in that they are not measures of the rate of disease in a population but rather are based on the number of observed infections divided by the number of infections that we would expect to see given a standardized population. The CDC's NHSN and AHRQ's MPSMS collect data through different mechanisms and with different clinical specifications, which will produce differences in the rates when calculated across the two sources.

Measures of HAIs shown in this chartbook follow:

- Distributions of State-specific SIRs for central line-associated bloodstream infections (CLABSIs) and NHSN-defined catheter-associated urinary tract infections (CAUTIs):
  - Restricted to acute care hospitals
  - Stratified by unit type

- Distributions of State-specific SIRs for hospital-onset *Clostridioides difficile* (*C. difficile*) infections seen in acute care hospitals

A CLABSI is a laboratory-confirmed bloodstream infection (LCBI) where a central line (CL) or umbilical catheter (UC) was in place for >2 calendar days on the date of event, with day of device placement being Day 1 and the line also being in place on the date of event or the day before. If a CL or UC was in place for >2 calendar days and then removed, the date of event of the LCBI must be the day of discontinuation or the next day to be a CLABSI.[3]

CAUTIs in the hospital setting are caused by instrumentation of the urinary tract.[4] Potential complications resulting from the development of CAUTI include cystitis, pyelonephritis, endocarditis, septic arthritis, and meningitis. The NHSN defines CAUTIs based on symptomatic urinary tract infection (SUTI), asymptomatic bacteremic UTI (ABUTI), or urinary system infection (USI) criteria and using specific criteria related to the timing of catheter use and CAUTI diagnosis. These criteria, which differ from those used by MPSMS, can be found at https://www.cdc.gov/nhsn/pdfs/pscmanual/7psccauticurrent.pdf.

C. difficile is a bacterium that can cause potentially fatal diarrhea. *C. difficile* infections are often associated with the use of antibiotics prescribed for other reasons that alter the balance of intestinal bacteria. The NHSN defines hospital-onset *C. difficile* infections as those detected on the 4th day or later after admission to an inpatient location.

Infections counted for SIRs are restricted to acute care hospitals (excluding critical access hospitals, long-term acute care hospitals, and inpatient rehabilitation facilities) and are stratified by unit type:

- Critical care units (excluding neonatal intensive care units)
- General hospital wards

SIRs were calculated for all 50 States, Washington DC, and Puerto Rico. Statewide SIRS were classified as:

- **Below 1.0** if the 95% confidence intervals bounding the SIR point estimates were entirely below 1.0.
- **Around 1.0** if the 95% confidence intervals bounding the SIR point estimates included 1.0.
- **Above 1.0** if the 95% confidence intervals bounding the SIR point estimates were entirely above 1.0.

The SIRs shown here are organized by:

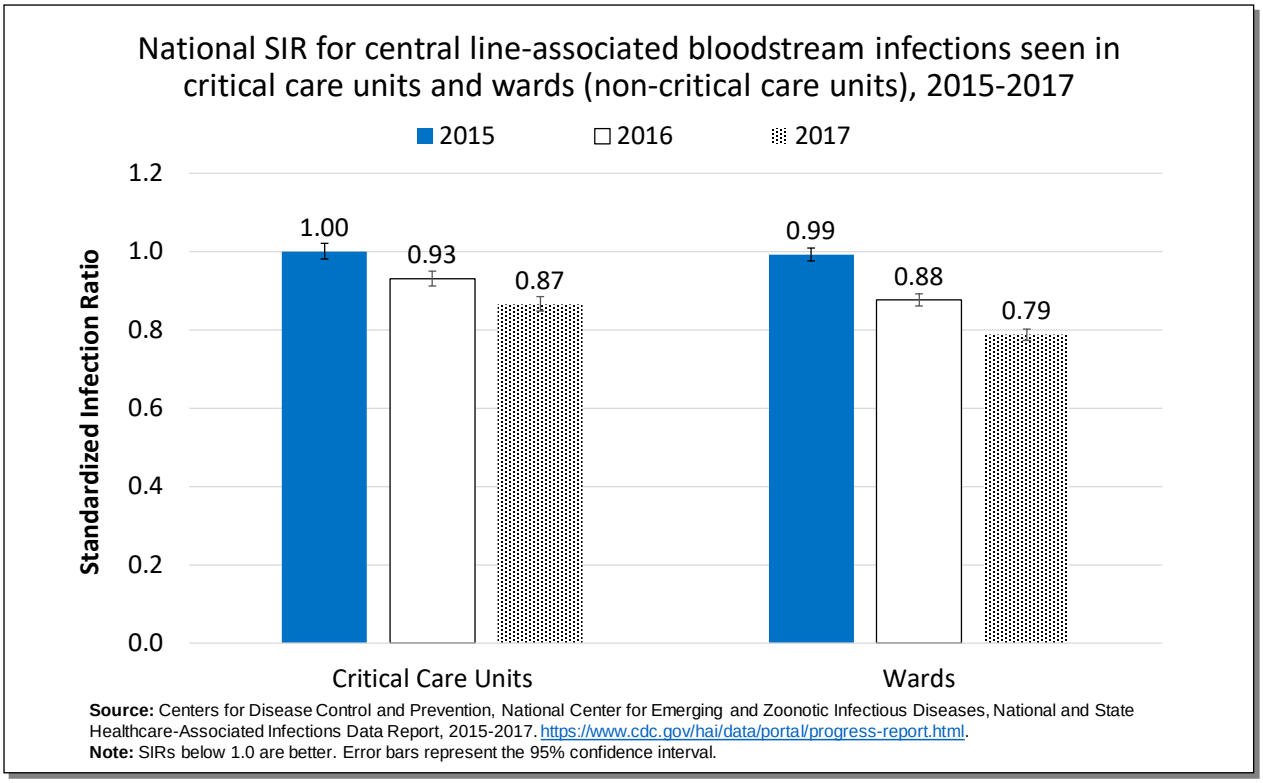
- Infection type: CLABSI, CAUTI, or *C. difficile*
- Where data were collected: critical care units vs. wards
- Summary level: National SIR vs. national summary of States vs. regional summary of States

Data were submitted to NHSN by hospitals in all 50 U.S. States, Washington, DC, Guam, Puerto Rico, and the U.S. Virgin Islands. SIRs were not calculated for States or territories with fewer than five facilities reporting data. Too few hospitals were located in Guam and the Virgin Islands for the calculation of State-level SIRs for any of the measures presented here. For the same reason, SIRs were not calculated for Vermont in 2017 for "Central line-associated bloodstream infections seen in critical care units" or for Puerto Rico in any year for "Hospital-onset *Clostridioides difficile* infections seen hospital wide." In all years, however, data received from all States and all of the listed territories were included in the calculation of the U.S. national SIR.

NHSN calculated SIRs (and their 95% confidence intervals) for 52 individual State-equivalent jurisdictions (50 States plus Washington, DC, and Puerto Rico). However, the State-level SIRs were not infrequently based on small numbers (i.e., <50) of observed or predicted site-specific infections. Therefore, SIRs are displayed for the entire United States or are summarized by whether the State SIRs were above, around, or below 1.0 and are aggregated across the entire country or by the U.S. census region.

The differences among regions have not been assessed for statistical significance. The United States is divided into four Census regions:

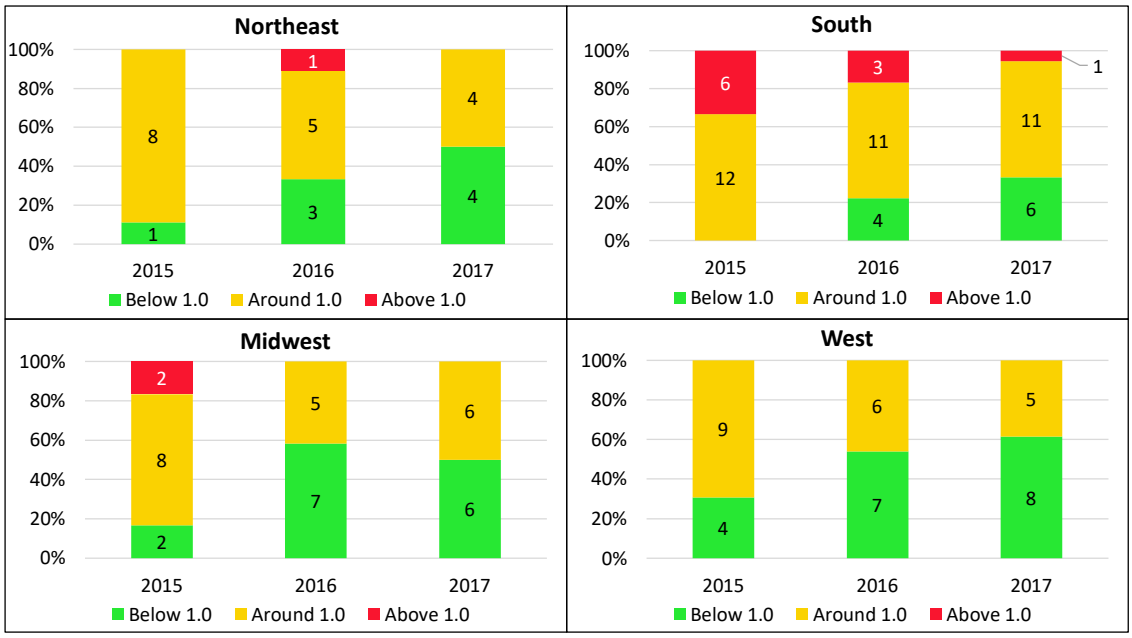
- Northeast (9 State equivalents: CT, MA, ME, NH, NJ, NY, PA, RI, VT)
- South (18 State equivalents: AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, PR, SC, TN, TX, VA, WV)
- Midwest (12 State equivalents: IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI)
- West (13 State equivalents: AK, AZ, CA, CO, HI, ID, MT, NM, NV, OR, UT, WA, WY)



Source: Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, National and State Healthcare-Associated Infections Data Report, 2015-2017. https://www.cdc.gov/hai/data/portal/progress-report.html.
Note: SIRs below 1.0 are better. Error bars represent the 95% confidence interval.

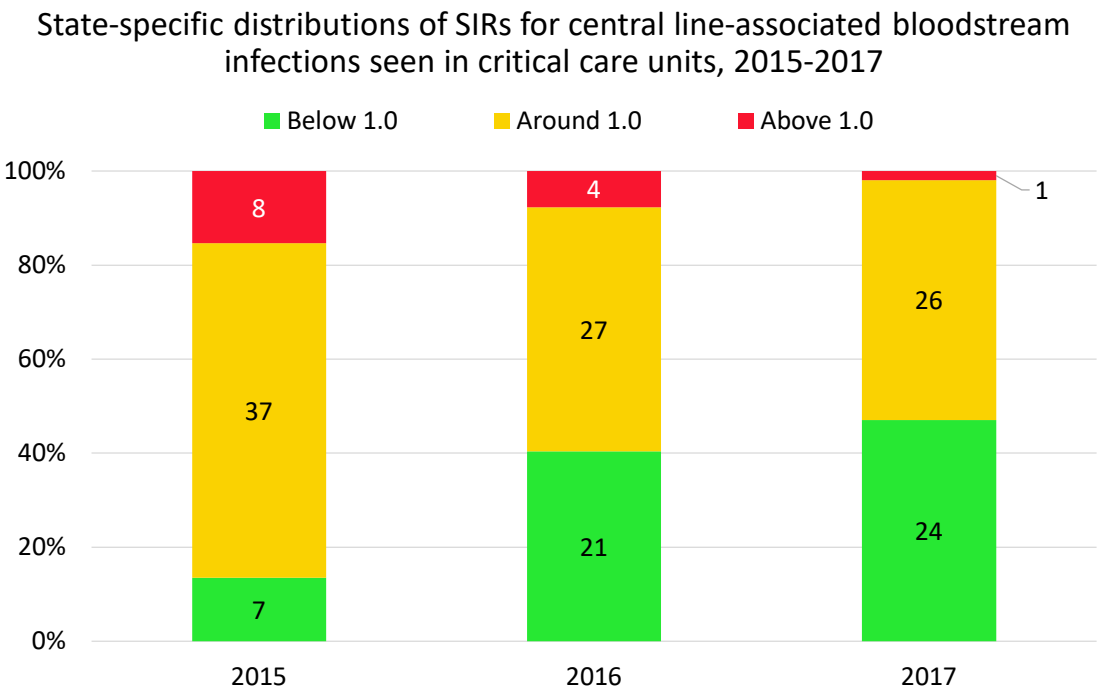
- **Importance:** Primary bloodstream infections associated with a central venous catheter account for approximately 8.3% of HAIs in acute care hospitals.[5] In addition, CLABSI SIRs are higher among critical care units than among non-critical care wards.[3]
- **95% Confidence Intervals:**
  - CLABSI critical care:
    - 2015, 0.981-1.021
    - 2016, 0.912-0.950
    - 2017, 0.848-0.885
  - CLABSI wards:
    - 2015, 0.976-1.009
    - 2016, 0.861-0.892
    - 2017, 0.773-0.802

Regional variation in State-specific distributions of SIRs for central line-associated bloodstream infections seen in critical care units, 2015-2017



Source: Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, National and State Healthcare-Associated Infections Data Report, 2015-2017. https://www.cdc.gov/hai/data/portal/progress-report.html.
Note: SIRs below 1.0 are better. Vermont did not have data available for this measure in 2017, reducing the overall number of State-equivalent jurisdictions in the analysis from 52 to 51 and lowering the count of Northeastern States in the analysis from 9 to 8.

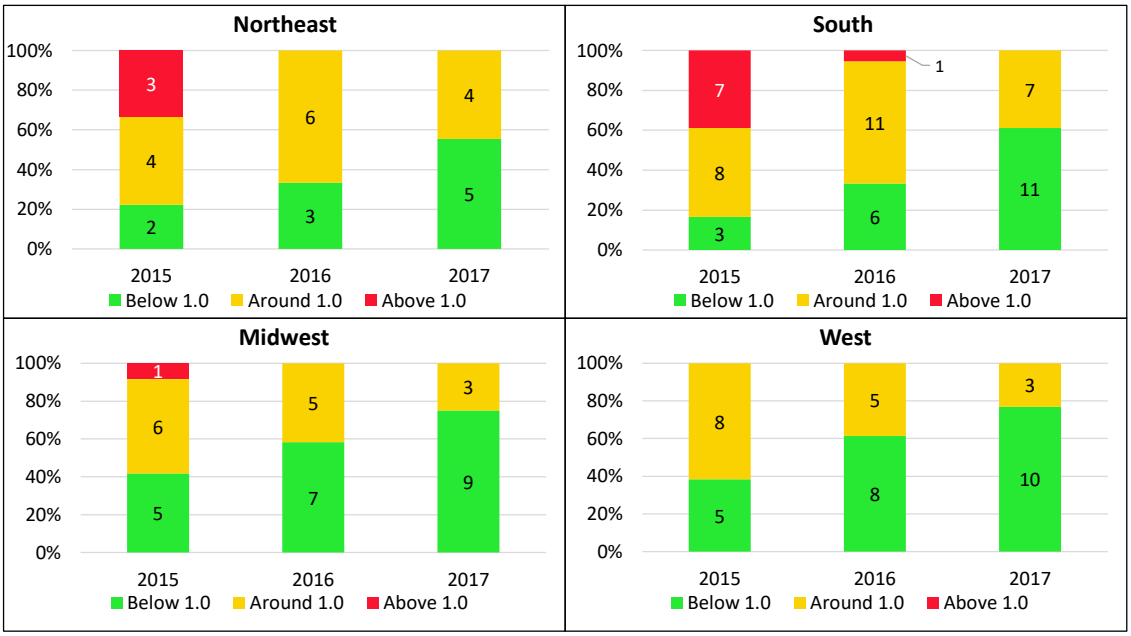
- For CLABSIs in critical care units:
  - The West had the highest percentage of States with SIRs under 1.0 in 2017 (62%).
  - The South had the lowest percentage of States with SIRs under 1.0 in 2017 (33%).
  - The South was the only region with a State with an SIR above 1.0 in 2017.



Source: Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, National and State Healthcare-Associated Infections Data Report, 2015-2017. https://www.cdc.gov/hai/data/portal/progress-report.html.
Note: SIRs below 1.0 are better. Vermont did not have data available for this measure in 2017, reducing the overall number of State-equivalent jurisdictions in the analysis from 52 to 51 for 2017.

- For CLABSIs seen in critical care units of acute care hospitals 2017:
  - State-specific SIRs ranged from 0.239 (minimum) to 1.419 (maximum).
  - Roughly half of State-specific SIRs fell in the range of 0.734 (25th percentile) to 0.949 (75th percentile).

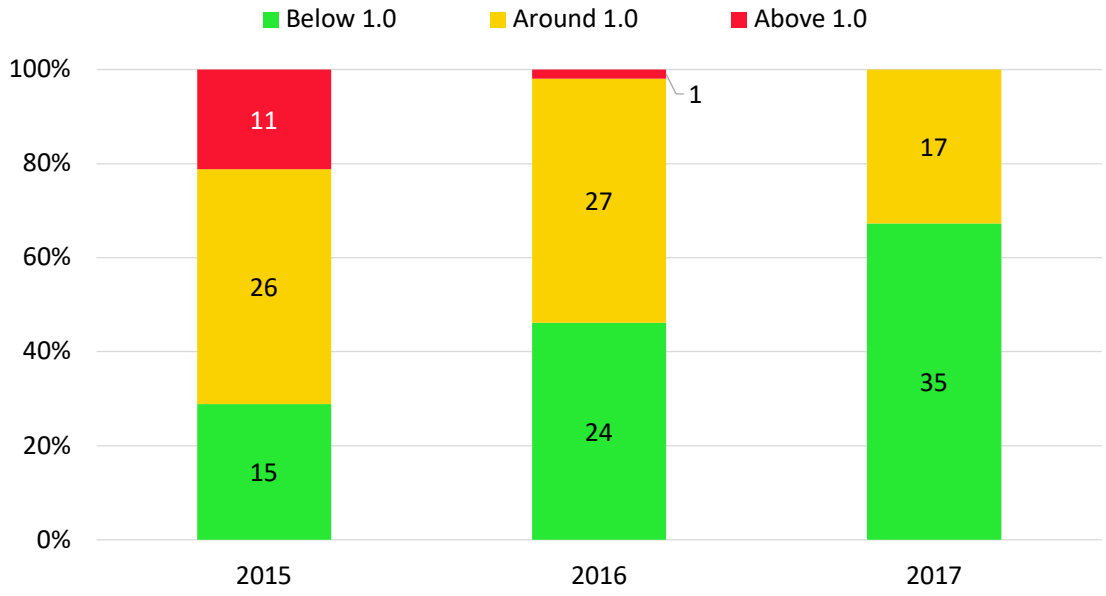
Regional variation in State-specific distributions of SIRs for central line-associated bloodstream infections seen on wards (non-critical care units), 2015-2017



Source: Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, National and State Healthcare-Associated Infections Data Report, 2015-2017. https://www.cdc.gov/hai/data/portal/progress-report.html.
Note: SIRs below 1.0 are better.

- For CLABSIs in non-critical care units of acute care hospitals:
  - The West had the highest percentage of States with SIRs under 1.0 in 2017 (77%).
  - The Northeast had the lowest percentage of States with SIRs under 1.0 in 2017 (56%).
  - No States had SIRs above 1.0 for this measure in 2017.

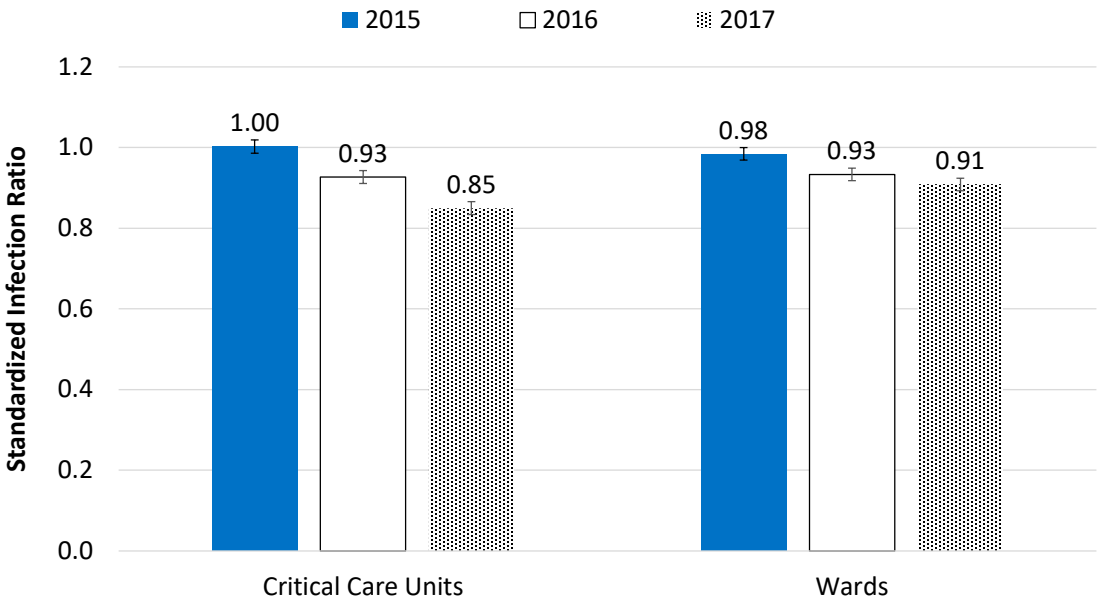
State-specific distribution of SIRs for central line-associated bloodstream infections seen on wards (non-critical care units), 2015-2017



Source: Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, National and State Healthcare-Associated Infections Data Report, 2015-2017. https://www.cdc.gov/hai/data/portal/progress-report.html.
Note: SIRs below 1.0 are better.

- For CLABSIs seen in non-critical care units of acute care hospitals in 2017:
  - State-specific SIRs ranged from 0.417 (minimum) to 1.202 (maximum).
  - The interquartile range of State-specific SIRs was 0.676 (25th percentile) to 0.903 (75th percentile).

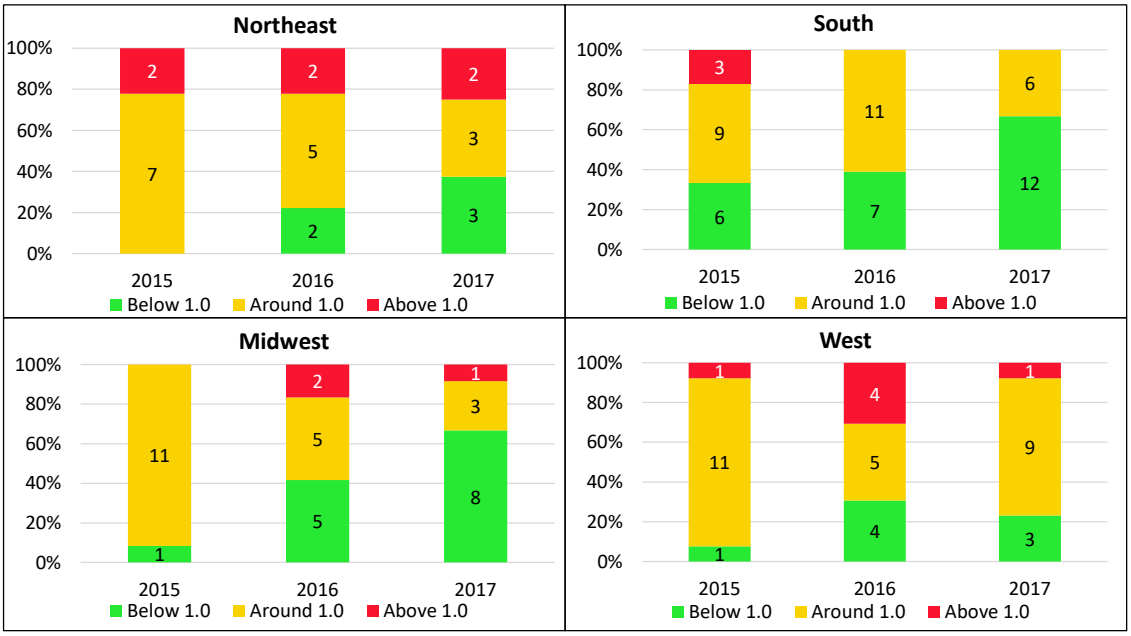
National SIR for catheter-associated urinary tract infections seen in critical care units and wards (non-critical care units), 2015-2017



Source: Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, National and State Healthcare-Associated Infections Data Report, 2015-2017. https://www.cdc.gov/hai/data/portal/progress-report.html.
Note: SIRs below 1.0 are better. Error bars represent the 95% confidence interval.

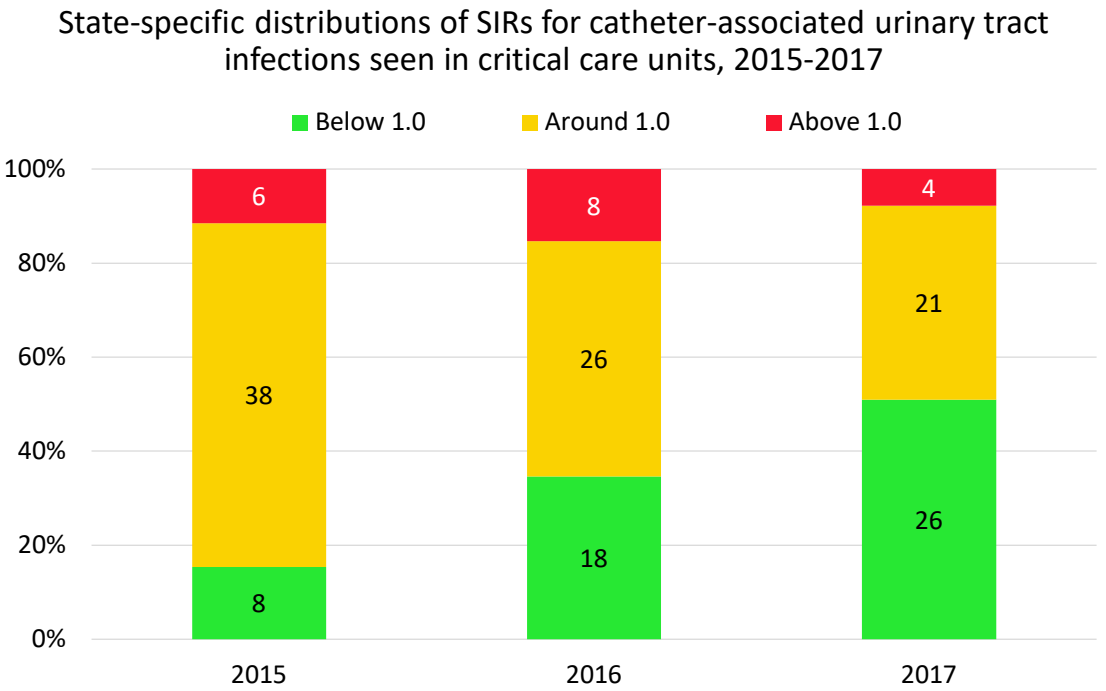
- **Importance:** Compared with rates of other hospital-acquired infections, CAUTI rates vary more among units in the same hospital.[6] ICU patients differ from non-ICU patients in their underlying health status, their risks of contracting CAUTIs, and the consequences of CAUTIs that occur.
- **95% Confidence Intervals:**
  - CAUTI, critical care:
    - 2015, 0.986-1.019
    - 2016, 0.911-0.943
    - 2017, 0.834-0.866
  - CAUTI, wards:
    - 2015, 0.969-1.000
    - 2016, 0.918-0.949
    - 2017, 0.893-0.924

Regional variation in State-specific distributions of SIRs for catheter-associated urinary tract infections seen in critical care units, 2015-2017



Source: Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, National and State Healthcare-Associated Infections Data Report, 2015-2017. https://www.cdc.gov/hai/data/portal/progress-report.html.
Note: SIRs below 1.0 are better.

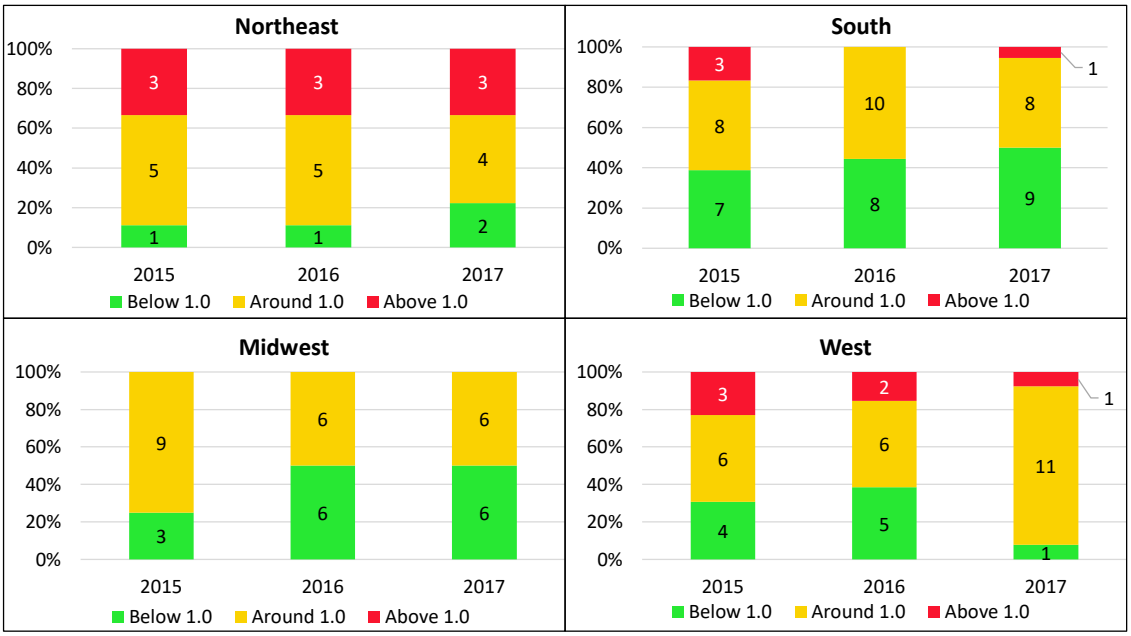
- For CAUTIs in critical care units of acute care hospitals:
  - The South and Midwest were tied for the highest percentage (67%) of statewide SIRs that were below 1.0.
  - The West had the lowest percentage (23%) of statewide SIRs that were below 1.0 in 2017.



Source: Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, National and State Healthcare-Associated Infections Data Report, 2015-2017. https://www.cdc.gov/hai/data/portal/progress-report.html.
Note: SIRs below 1.0 are better. Vermont did not have data available for this measure in 2017, reducing the overall number of State-equivalent jurisdictions in the analysis from 52 to 51 for 2017.

- For CAUTIs seen in critical care units of acute care hospitals:
  - State-specific SIRs ranged from 0.555 (minimum) to 1.615 (maximum).
  - Roughly half of State-specific SIRs fell in the range of 0.754 (25th percentile) to 1.008 (75th percentile).

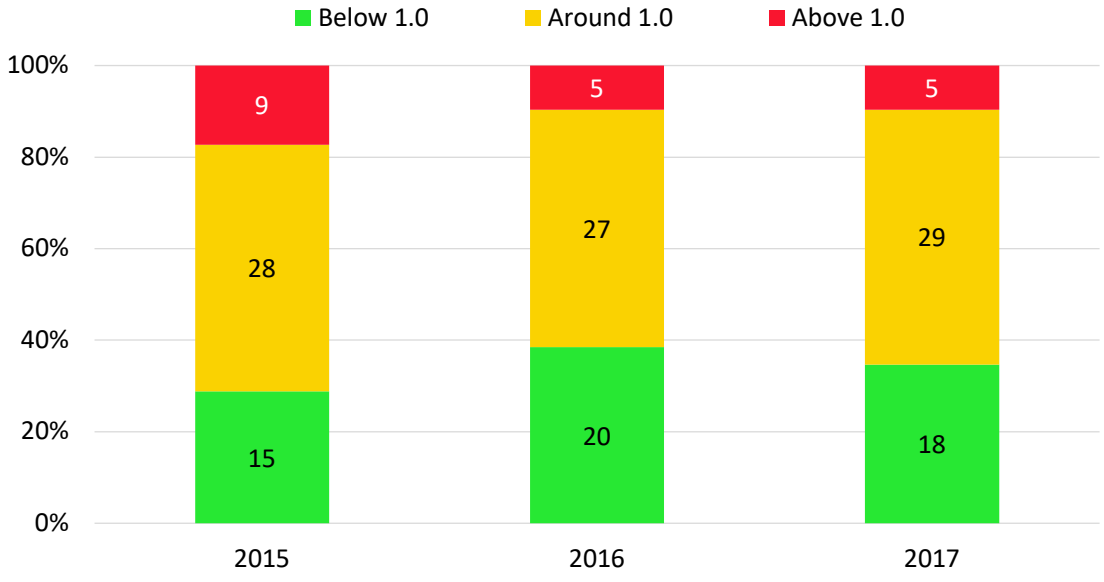
Regional variation in State-specific distributions of SIRs for catheter-associated urinary tract infections seen on wards (non-critical care units), 2015-2017



Source: Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, National and State Healthcare-Associated Infections Data Report, 2015-2017. https://www.cdc.gov/hai/data/portal/progress-report.html.
Note: SIRs below 1.0 are better.

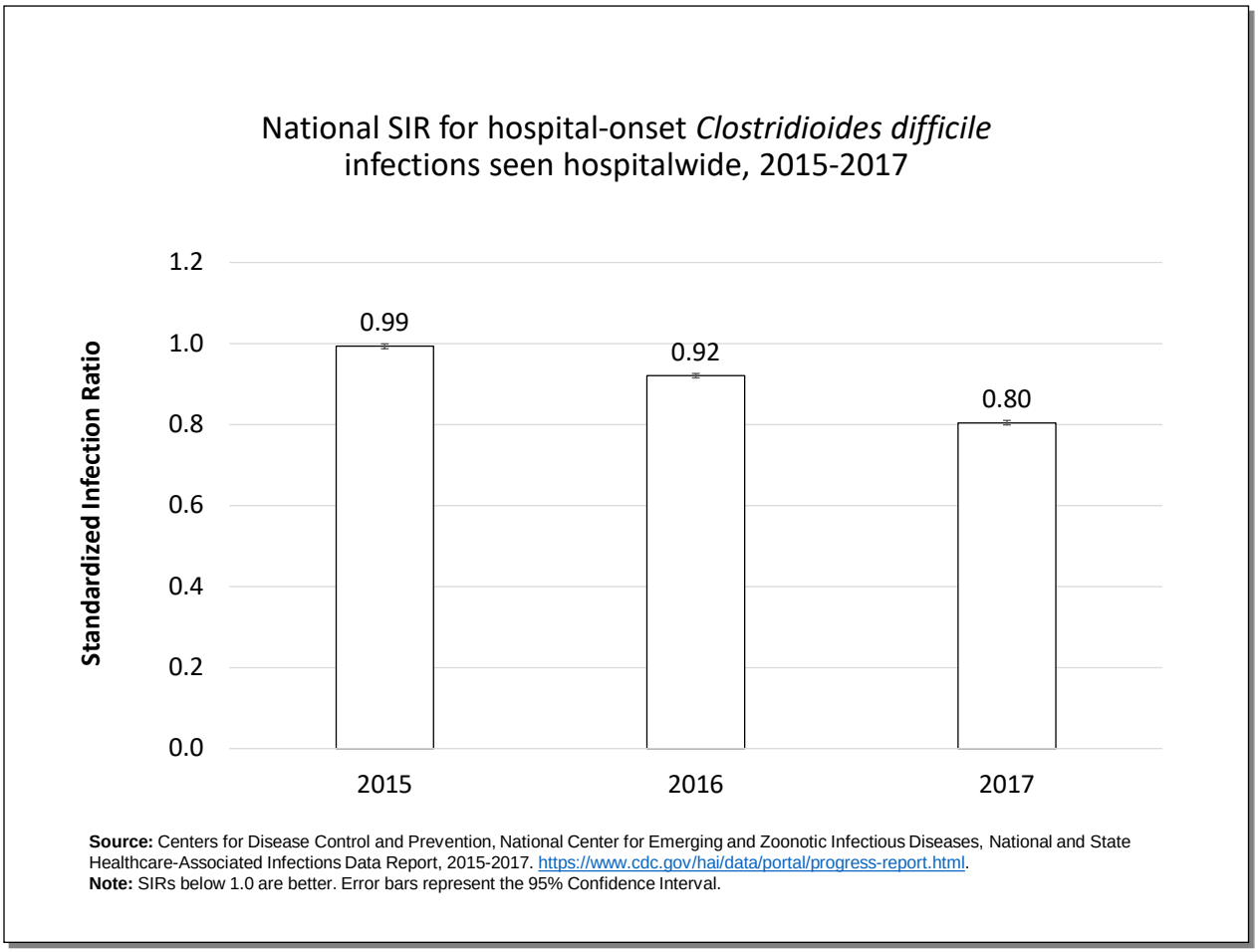
- For CAUTIs seen on acute care hospital wards only (not critical care locations):
  - The South and Midwest were tied for having the highest percentage (50%) of statewide SIRs that were below 1.0 in 2017.
  - The West had the lowest percentage (8%) of statewide SIRs that were below 1.0 in 2017.

State-specific distributions of SIRs for catheter-associated urinary tract infections seen on wards (non-critical care units), 2015-2017



Source: Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, National and State Healthcare-Associated Infections Data Report, 2015-2017. https://www.cdc.gov/hai/data/portal/progress-report.html.
Note: SIRs below 1.0 are better.

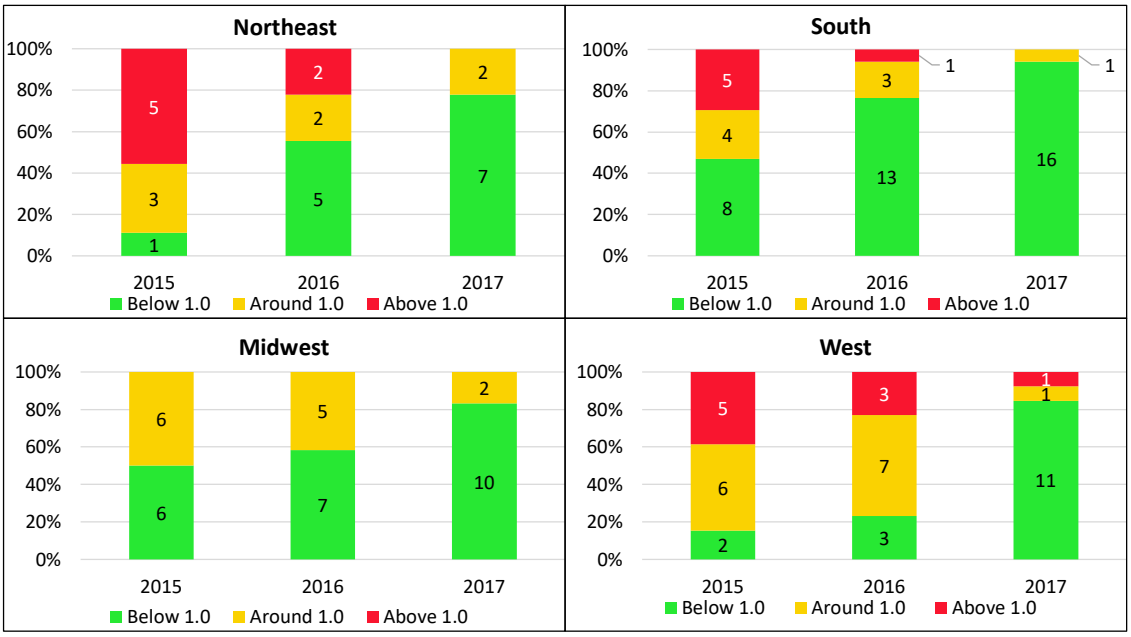
- For CAUTIs seen on wards (non-critical care units) of acute care hospitals:
  - State-specific SIRs ranged from 0.573 (minimum) to 1.795 (maximum).
  - Roughly half of State-specific SIRs fell in the range of 0.805 (25th percentile) to 1.017 (75th percentile).



Source: Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, National and State Healthcare-Associated Infections Data Report, 2015-2017. https://www.cdc.gov/hai/data/portal/progress-report.html.
Note: SIRs below 1.0 are better. Error bars represent the 95% Confidence Interval.

- **95% Confidence Intervals:**
  - 2015, 0.987-0.999
  - 2016, 0.915-0.926
  - 2017, 0.799-0.810

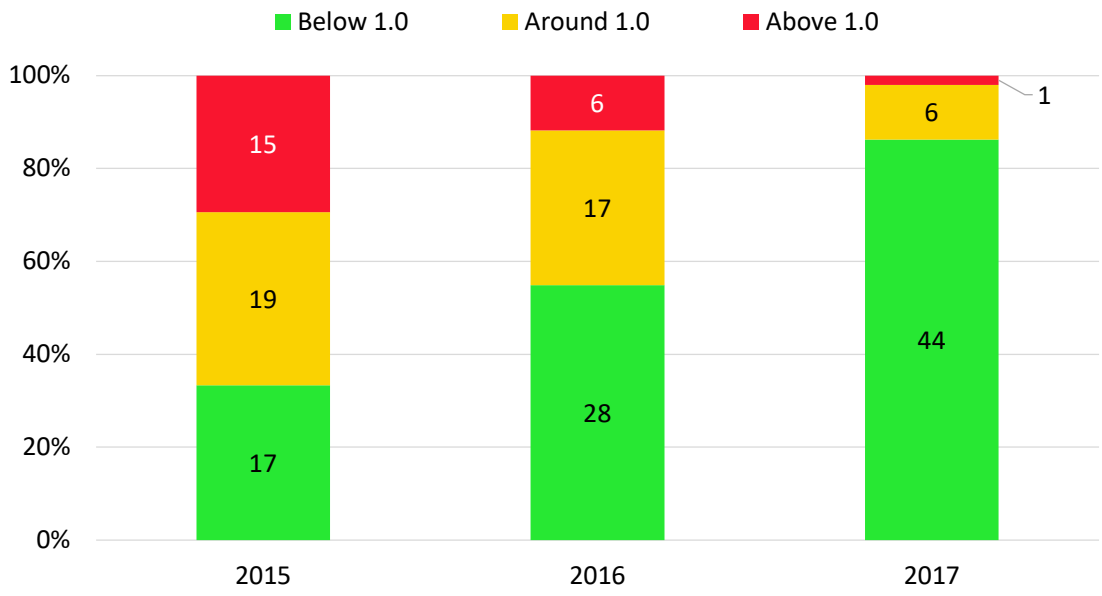
Regional variation in State-specific distributions of SIRs for hospital-onset *Clostridioides difficile* infections seen hospitalwide, 2015-2017



Source: Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, National and State Healthcare-Associated Infections Data Report, 2015-2017. https://www.cdc.gov/hai/data/portal/progress-report.html.
Note: SIRs below 1.0 are better. The SIR for Puerto Rico was not calculated for this measure in 2015-2017, reducing the overall number of State-equivalent jurisdictions in the analysis from 52 to 51 for all years and lowering the count of Southern States in the analysis from 18 to 17.

- **Regional Distributions of State-Specific SIRs:**
  - For hospital-onset *C. difficile* infection seen anywhere in the hospital, the South had the highest percentage (94%) of statewide SIRs that were below 1.0 in 2017.
  - The Northeast had the lowest percentage (78%) of statewide SIRs under 1.0 in 2017.

State-specific distributions of SIRs for hospital-onset *Clostridioides difficile* infections seen hospitalwide, 2015-2017



Source: Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, National and State Healthcare-Associated Infections Data Report, 2015-2017. https://www.cdc.gov/hai/data/portal/progress-report.html.
Note: SIRs below 1.0 are better. The SIR for Puerto Rico was not calculated for this measure in 2015-2017, reducing the overall number of State-equivalent jurisdictions in the analysis from 52 to 51 for all years.

- For hospital-onset *C. difficile* infection seen anywhere in the hospital:
  - State-specific SIRs ranged from 0.651 (minimum) to 1.136 (maximum).
  - Roughly half of State-specific SIRs fell in the range of 0.752 (25th percentile) to 0.892 (75th percentile).

Tools for Reducing Central Line-Associated Bloodstream Infections in Hospitals

- **Purpose:** To help hospitals prevent CLABSIs and improve safety culture
- **Methods:** Implementing evidence-based, practical resources and concepts from the Comprehensive Unit-based Safety Program (CUSP)
- **Intended users:** Hospital facilities
- Available tools: Checklists, preventable incidence calculators, audit forms, event report templates
- **Link:** https://www.ahrq.gov/professionals/education/curriculum-tools/clabsitools/index.html

Through use of the CUSP toolkit and CLABSI tools, more than 100 hospital ICUs in Michigan nearly eliminated CLABSIs. Nationwide, the use of this toolkit helped more than 1,100 hospital intensive care units reduce rates of CLABSI by 40% in aggregate. Refer to https://www.ahrq.gov/workingforquality/priorities-in-action/michigan-health-and-hospital-association-keystone-center.html.

Tools for Reducing Catheter-Associated Urinary Tract Infections in Hospitals

- **Purpose:** To help hospitals prevent CAUTIs and improve safety culture
- **Method:** Implementing evidence-based, practical resources and concepts from the Comprehensive Unit-based Safety Program
- **Intended users:** Hospital facilities
- **Available tools:** Guides, checklists, webinars, learning modules, data interpretation guides
- **Link:** https://www.ahrq.gov/professionals/quality-patient-safety/hais/tools/cauti-hospitals/Index.html
- **Potential Measures of Effectiveness:**
  - Number of symptomatic CAUTIs attributable to each unit per month
  - Days since last CAUTI
- **Impact:** Use of the CUSP for CAUTI toolkit helped more than 700 hospital non-ICU units reduce rates of CAUTI by 30%.

Procedure-Related Events

More than 20 million invasive, therapeutic surgeries are performed in the United States each year.[7] Postoperative adverse events are not uncommon and are associated with higher rates of mortality and morbidity.[8] Postoperative adverse events also increase both hospitalization length of stay and cost.[9]

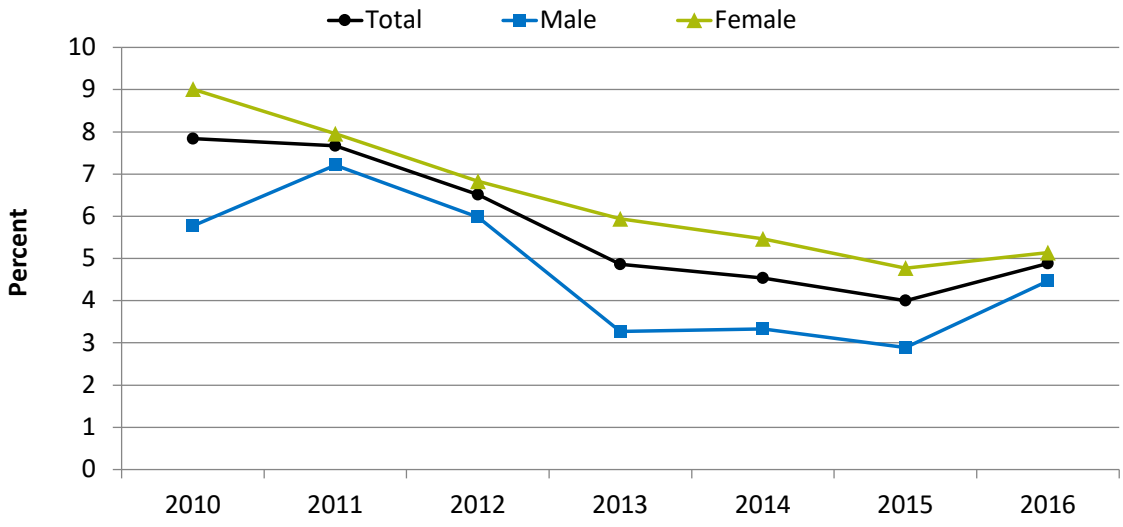
More than 50 million inpatient procedures are performed in the United States each year.[10] Approximately 48 million outpatient procedures were performed in 2010.[11]

Procedure-related event measures shown in this chartbook follow:

- Adverse events related to hip/knee replacement:
  - Adult patients receiving hip joint replacement who experienced adverse events
  - Inpatient adverse events in adults receiving hip joint replacement due to degenerative conditions
  - Inpatient adverse events in adults receiving knee replacement
- Other postoperative events:
  - Adult surgery patients with postoperative pneumonia events
- Maternal morbidity and mortality:
  - Cesarean deliveries among low-risk first births
  - Venous thromboembolism or pulmonary embolism per 1,000 delivery discharges
  - In-hospital deaths per 100,000 delivery hospitalizations

The maternal morbidity and mortality measures are new to the QDR with this release and were identified to further understanding of the significance of these events and opportunities for improvement in maternal healthcare.

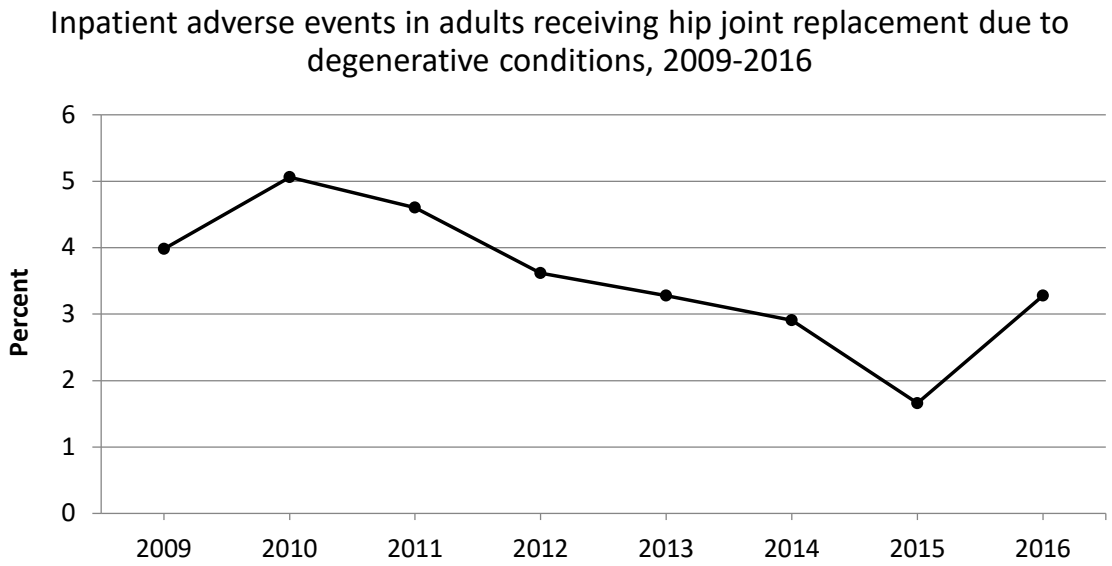
Adverse Events in Hip Replacement Patients



Source: Agency for Healthcare Research and Quality and Centers for Medicare & Medicaid Services (CMS), Medicare Patient Safety Monitoring System (MPSMS), 2010-2016.
Denominator: All patients age 18 years and over in the MPSMS sample who had a surgical procedure performed to replace a hip joint due to degenerative conditions or a fractured hip.
Note: For this measure, lower percentages are better. Hospitals in Puerto Rico, the Virgin Islands, and Maryland were not included in the annual samples. Samples were drawn from the CMS Hospital Inpatient Quality Reporting program and consist of medical records for discharges following hip arthroplasty procedures as defined by the Surgical Care Improvement Project. Adverse events include postoperative infection (acute or early deep), dehiscence, necrosis, hematoma, nerve injury, major bleeding, dislocation, cardiovascular complications, catheter-associated urinary tract infection or pneumonia; return to operating room after procedure (excludes same-side revision); revision during the index hospital stay (same side as index procedure); periprosthetic fracture; and postoperative venous thromboembolic event during hospital stay.

- **Importance:** Hip replacement is most commonly performed in older adults, who have an increased risk of adverse events after these procedures. Hip and knee replacements are the most common major surgeries for Medicare beneficiaries.[12]
- **Overall Percentage:** In 2016, 4.9% of patients receiving a hip joint replacement due to fracture or degenerative conditions experienced adverse events.
- **Trends:** Inpatient adverse events in adults receiving hip joint replacements due to fracture improved from 16.4% in 2009 to 9.5% in 2016, while adverse events among adult patients receiving hip joint replacements due to degenerative conditions improved from 4.0% to 3.3% during the same time.
- **Groups With Disparities:** In 2016, there were no statistically significant differences by gender in the percentage of hip replacement patients who had adverse events.

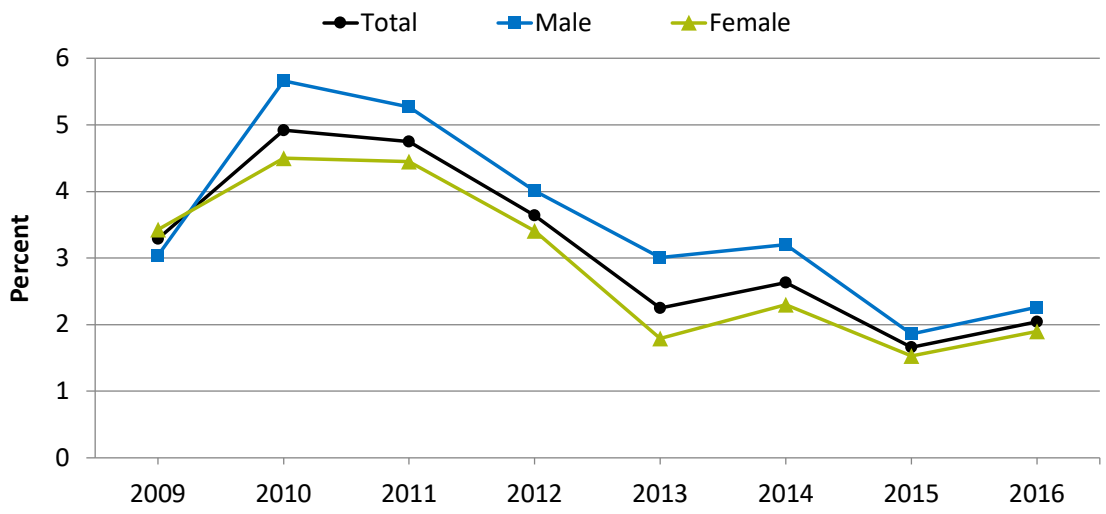
Adverse Events in Hip Replacement Patients With Degenerative Conditions



Source: Agency for Healthcare Research and Quality and Centers for Medicare & Medicaid Services, Medicare Patient Safety Monitoring System (MPSMS), 2009-2016.
Denominator: All patients in the MPSMS sample who had a surgical procedure performed (defined by International Classification of Diseases, Ninth Revision procedure code 81.51) to replace a hip joint due to degenerative conditions.
Note: For this measure, lower percentages are better. Adverse events include postoperative infection (acute or early deep), dehiscence, necrosis, hematoma, nerve injury, major bleeding, dislocation, cardiovascular complications, catheter-associated urinary tract infection or pneumonia; return to operating room after procedure (excludes same-side revision); revision during the index hospital stay (same side as index procedure); periprosthetic fracture; and postoperative venous thromboembolic event during hospital stay.

- **Importance:** Hip replacement is one of the most common procedures experienced by Medicare beneficiaries.
- **Overall Percentage:** In 2016, 3.3% of adults receiving a hip joint replacement due to degenerative conditions experienced an adverse event in the hospital.
- **Trend:** The percentage of patients experiencing adverse events in the hospital after receiving a hip joint replacement improved from 4.0% in 2009 to 3.3% in 2016.
- **Groups With Disparities:** No disparities were found in 2016. With a total sample size of only 975 in 2016, most subgroup comparisons were not possible due to small sample sizes.

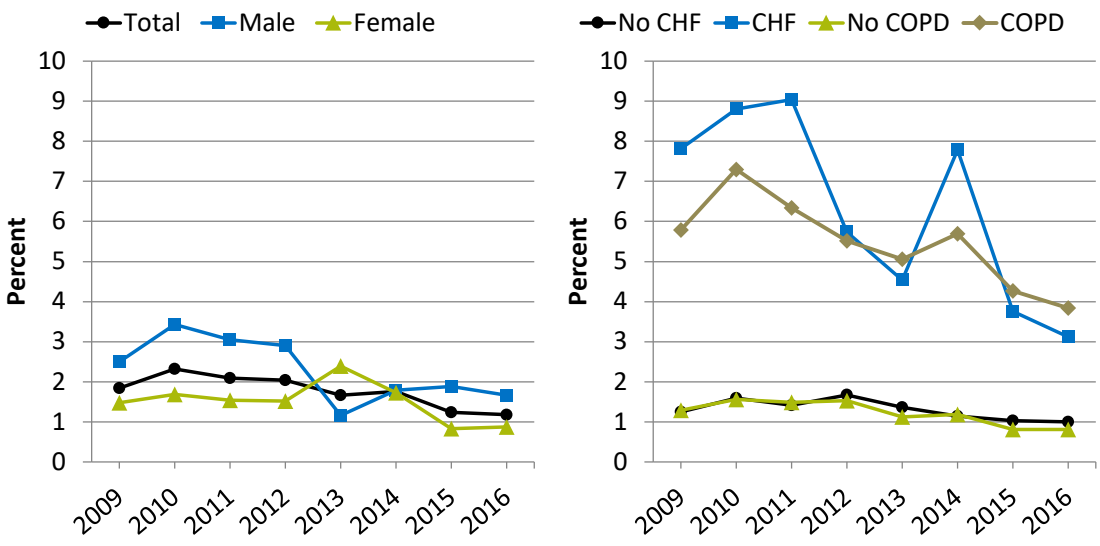
Adverse Events in Knee Replacement Patients



Source: Agency for Healthcare Research and Quality (AHRQ) and Centers for Medicare & Medicaid Services (CMS), Medicare Patient Safety Monitoring System (MPSMS), 2009-2016.
Denominator: All patients in the MPSMS sample who undergo a knee joint replacement (defined by International Classification of Diseases, Ninth Revision procedure code 81.54).
Note: For this measure, lower percentages are better. Adverse events include postoperative infection (acute or early deep), dehiscence, necrosis, hematoma, nerve injury, major bleeding, dislocation, cardiovascular complications, catheter-associated urinary tract infection or pneumonia; return to operating room after procedure (excludes same-side revision); revision during the index hospital stay (same side as index procedure); periprosthetic fracture; and postoperative venous thromboembolic event during hospital stay.

- **Importance:** Knee replacement is one of the most common procedures experienced by Medicare beneficiaries.
- **Overall Percentage:** In 2016, 2.0% of adults experienced adverse events following a knee replacement procedure.
- **Trends:** The adverse event rate for adults receiving knee replacement improved between 2009 and 2016 overall (from 3.3% to 2.0%) and for both men (3.0% to 2.3%) and women (3.4% to 1.9%).
- **Groups With Disparities:** No significant disparities were found in 2009 or 2016.

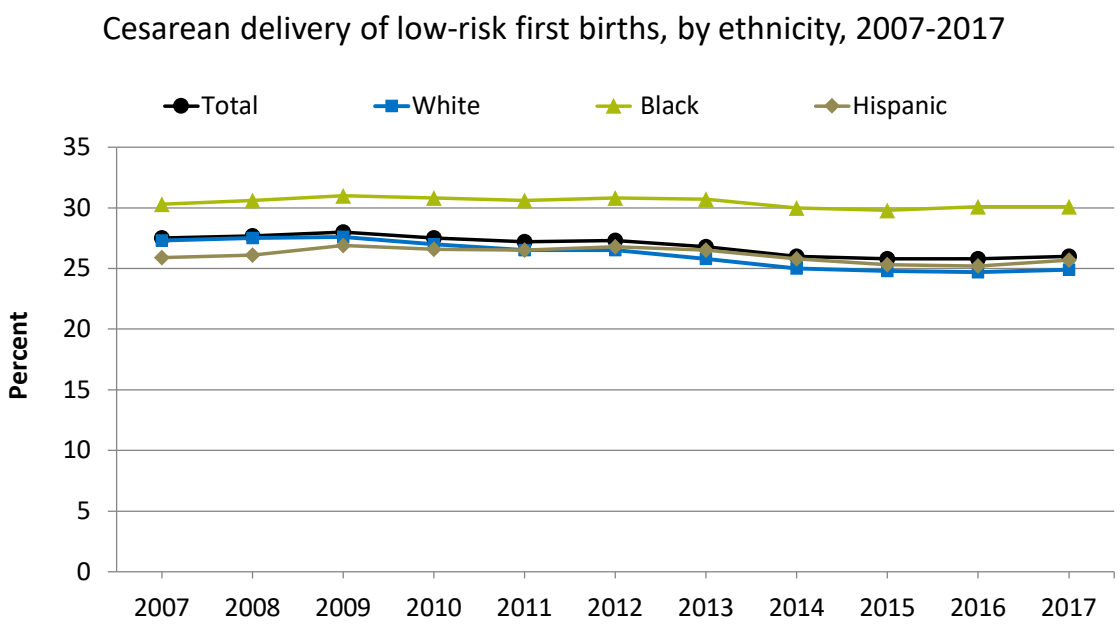
Postoperative Pneumonia Events



Key: CHF = congestive heart failure (also includes pulmonary edema). COPD = chronic obstructive pulmonary disease.
Source: Agency for Healthcare Research and Quality and Centers for Medicare & Medicaid Services, Medicare Patient Safety Monitoring System (MPSMS), 2009-2016.
Denominator: All patients from the MPSMS sample who had at least one of the selected major surgical procedures identified as part of the Surgical Care Improvement Project and did not have pneumonia before the procedure.
Note: For this measure, lower percentages are better.

- **Importance:** Pneumonia is a common postoperative adverse event associated with significant morbidity and mortality. Risk factors differ by type of surgery but frequently include advanced age and chronic conditions such as congestive heart failure (CHF) and chronic obstructive pulmonary disease (COPD).[13]
- **Overall Percentage:** In 2016, 1.2% of adults who had at least one of several selected surgical procedures subsequently contracted pneumonia.
- **Trends:** The percentage of patients who contracted pneumonia after one of several selected surgical procedures improved from 1.8% in 2009 to 1.2% in 2016. Trends were not analyzed for CHF and COPD separately.
- **Groups With Disparities in 2016:**
  - Females were less likely than males to contract postoperative pneumonia (0.9% vs. 1.7%).
  - Patients with CHF were more likely to contract postoperative pneumonia than those without CHF (3.1% vs. 1.0%).
  - Patients with COPD were more likely to contract postoperative pneumonia than those without COPD (3.8% vs. 0.8%).

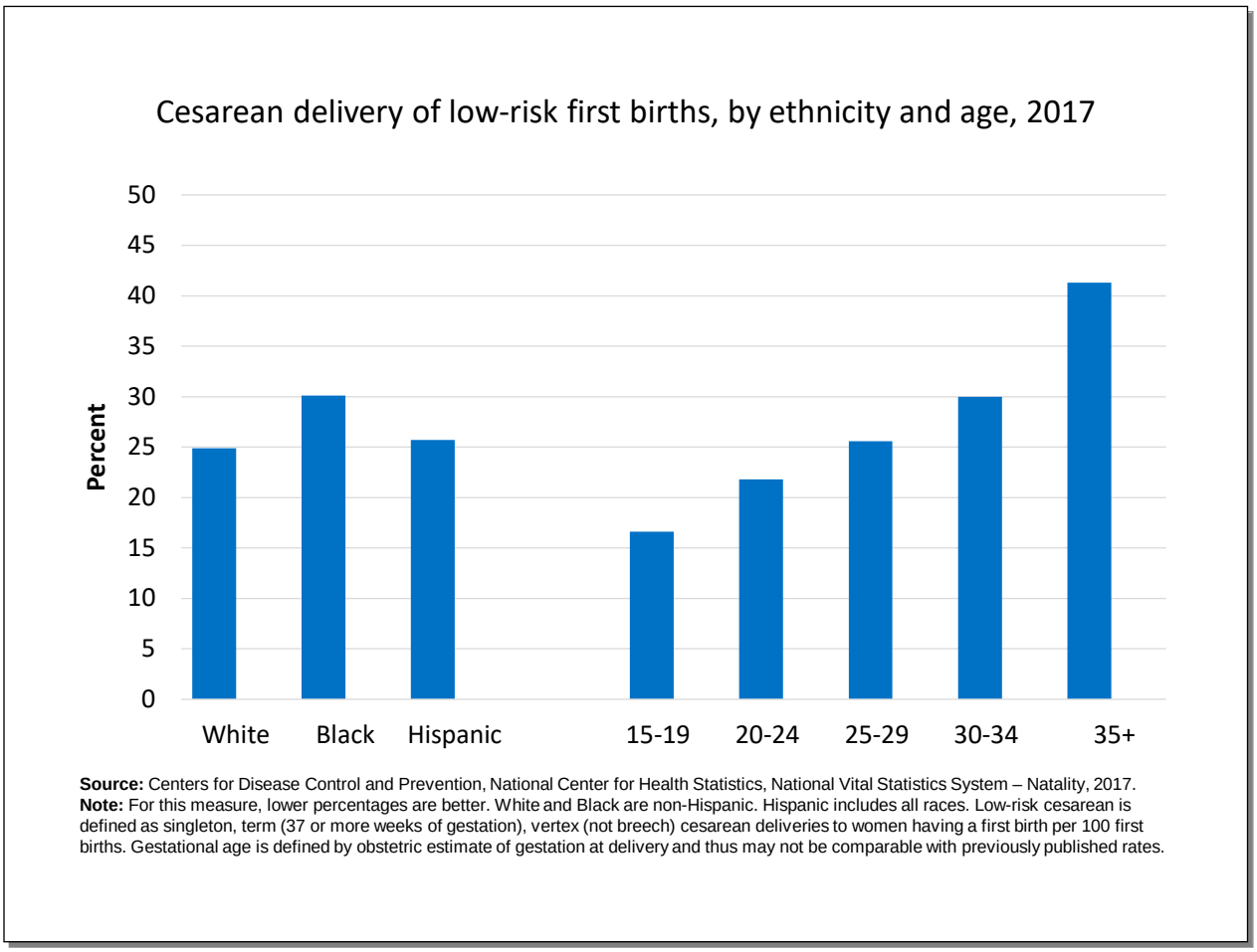
Trends in Cesarean Delivery of Low-Risk First Births



Source: Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System – Natality, 2007-2017.
Note: For this measure, lower percentages are better. Black and White are non-Hispanic. Hispanic includes all races. Low-risk cesarean is defined as singleton, term (37 or more weeks of gestation), vertex (not breech) cesarean deliveries to women having a first birth per 100 first births. Gestational age is defined by obstetric estimate of gestation at delivery and thus may not be comparable with previously published rates.

- **Importance:** Cesarean deliveries are associated with heightened levels of adverse events and complications for future pregnancies. Limiting cesarean deliveries in low-risk births is seen as an important part of reducing cesarean deliveries overall.
- **Overall Percentage:** In 2017, cesarean deliveries made up 26.0% of low-risk births for women giving birth for the first time.
- **Groups With Disparities:** In 2007 and in 2017, Blacks had higher rates of cesarean deliveries compared with Whites (30.3% vs. 27.3% in 2007; 30.1% vs. 24.9% in 2017).

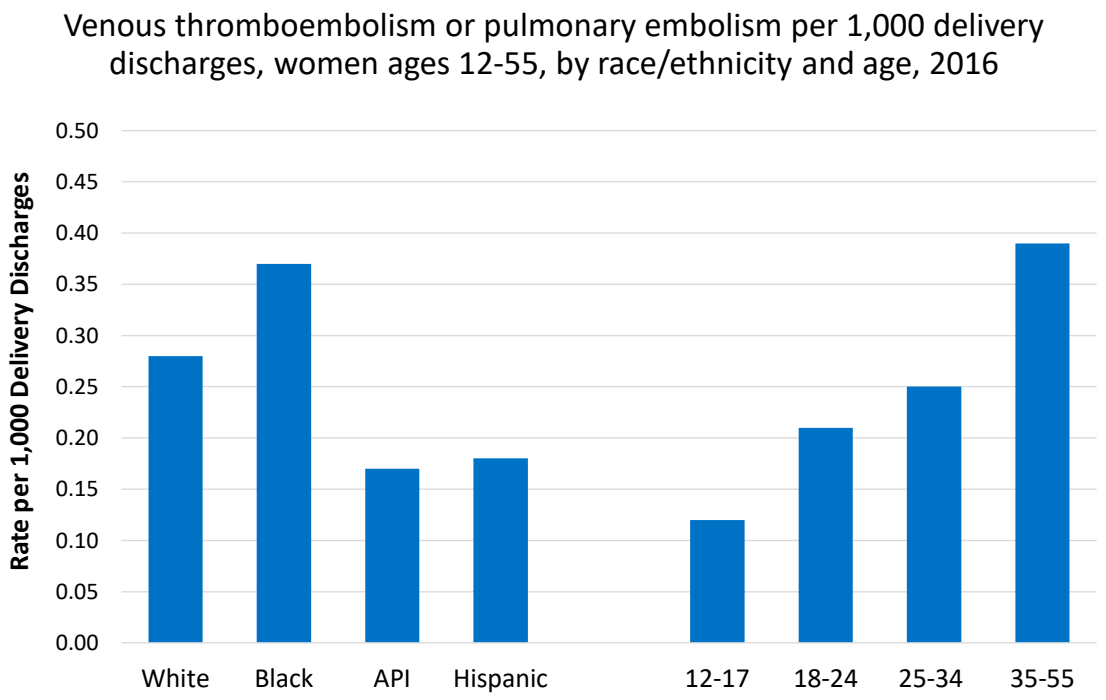
Disparities in Cesarean Delivery of Low-Risk First Births



Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System – Natality, 2017.
Note: For this measure, lower percentages are better. White and Black are non-Hispanic. Hispanic includes all races. Low-risk cesarean is defined as singleton, term (37 or more weeks of gestation), vertex (not breech) cesarean deliveries to women having a first birth per 100 first births. Gestational age is defined by obstetric estimate of gestation at delivery and thus may not be comparable with previously published rates.

- **Importance:** Cesarean deliveries are associated with heightened levels of adverse events and complications for future pregnancies. Limiting cesarean deliveries in low-risk births is seen as an important part of reducing cesarean deliveries overall.
- **Overall Percentage:** In 2017, the percentage of cesarean deliveries among low-risk first births was 26.0%.
- **Groups With Disparities:**
  - In 2017, Blacks had higher rates of cesarean deliveries than Whites (30.1% vs. 24.9%).
  - Women ages 15-19 giving birth for the first time had lower rates of cesarean delivery than women ages 20-24 (16.6% vs. 21.8%).
  - Women ages 25-29, 30-34, and 35 and over giving birth for the first time all had higher rates of cesarean delivery compared with women ages 20-24 (25.6%, 30.0%, and 41.3%, respectively, vs. 21.8%).

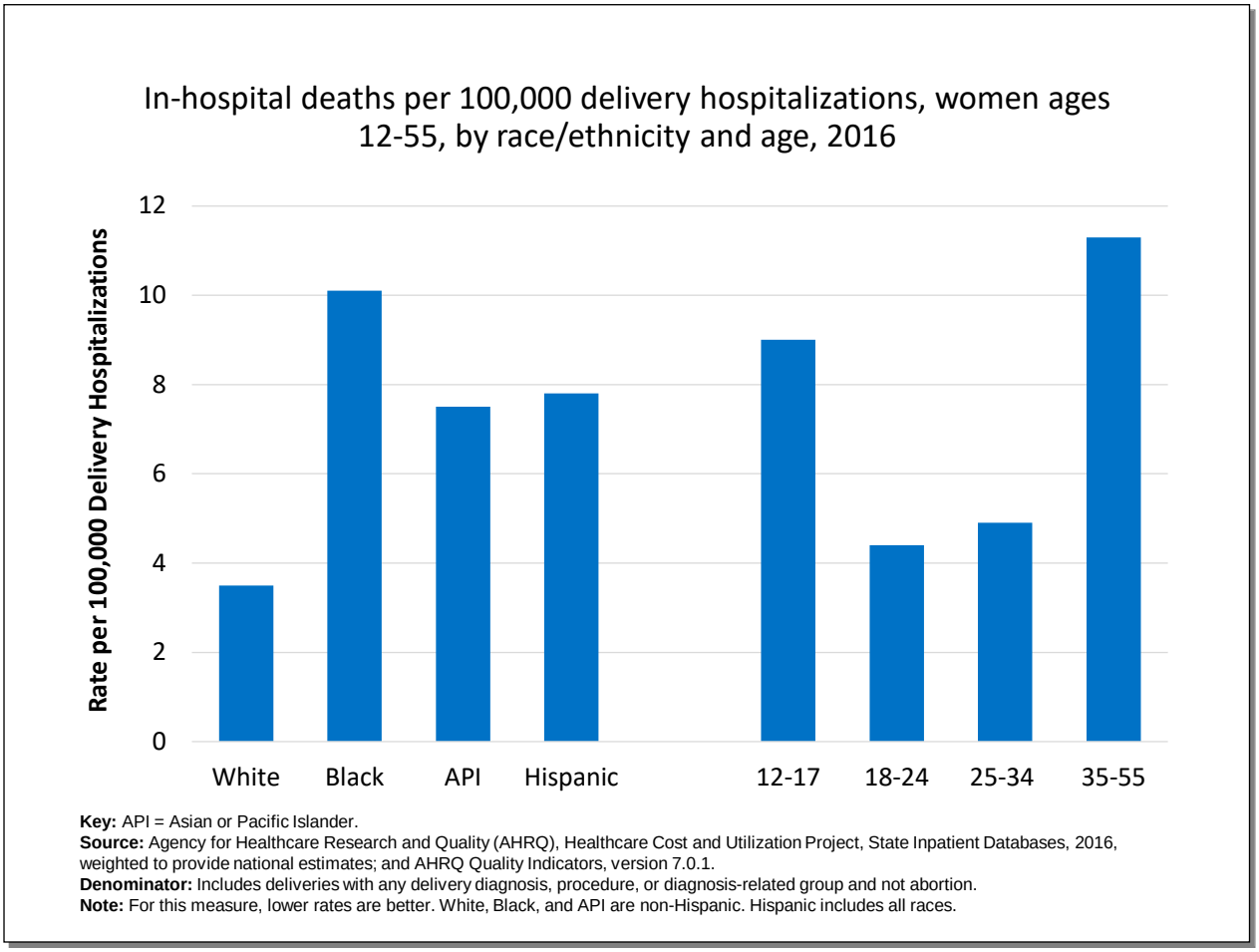
Adverse Events Related to Childbirth



Key: API = Asian or Pacific Islander.
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project, State Inpatient Databases, 2016, weighted to provide national estimates; and AHRQ Quality Indicators, version 7.0.1.
Denominator: Includes deliveries with any delivery diagnosis, procedure, or diagnosis-related group and not abortion.
Note: For this measure, lower rates are better. White, Black, and API are non-Hispanic. Hispanic includes all races.

- **Importance:** From 2011 to 2014, 9.1% of pregnancy-related deaths were caused by thrombotic pulmonary embolism. Reductions in venous thromboembolism (VTE) and pulmonary embolism (PE) could save lives.[14]
- **Overall Rate:** In 2016, the overall rate of VTE or PE among women ages 12-55 was 0.26 per 1,000 delivery discharges.
- **Groups With Disparities:**
  - Hispanic women were less likely to experience VTE/PE during a delivery hospitalization than White women (0.18 vs. 0.28 per 1,000 delivery discharges).
  - Asian and Pacific Islander women also had a lower VTE/PE rate than White women (0.17 vs. 0.28 per 1,000 delivery discharges).
  - Black women, however, were more likely than White women to experience VTE/PE (0.37 vs. 0.28 per 1,000 delivery discharges).
  - Compared with women ages 18-24, women ages 35-55 were more likely to experience VTE/PE (0.39 vs. 0.21 per 1,000 delivery discharges).

In-Hospital Deaths Related to Childbirth



Key: API = Asian or Pacific Islander.
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project, State Inpatient Databases, 2016, weighted to provide national estimates; and AHRQ Quality Indicators, version 7.0.1.
Denominator: Includes deliveries with any delivery diagnosis, procedure, or diagnosis-related group and not abortion.
Note: For this measure, lower rates are better. White, Black, and API are non-Hispanic. Hispanic includes all races.

- **Importance:** Pregnancy-related mortality in the United States has risen from 7.4 deaths per 100,000 live births in 1987 to 18.0 deaths in 2014.[14] Severe maternal morbidity, including mortality, disproportionately affects minority and low-income women.[15] About one-third of pregnancy-related deaths occur at delivery or within 1 week of delivery. Maternal deaths that occur during hospital stays may provide a window into both system and provider-level factors that can play a role in preventing maternal death.[14]
- **Overall Rate:** In 2016, the rate of deaths per 100,000 delivery hospitalizations among women ages 12-55 was 5.9 (data not shown).
- **Groups With Disparities:**
  - In-hospital deaths were more common among Hispanic women compared with White women (7.8 vs. 3.5 per 100,000 delivery hospitalizations).
  - In-hospital deaths were more common among Asian/Pacific Islander women compared with White women (7.5 vs. 3.5 per 100,000 delivery hospitalizations) and among Black women compared with White women (10.1 vs. 3.5 per 100,000 delivery hospitalizations).
  - Compared with women ages 18-24, women ages 35-55 were more likely to die during a delivery hospitalization (11.3 vs. 4.4 per 100,000 delivery hospitalizations).

Readmissions and Complications

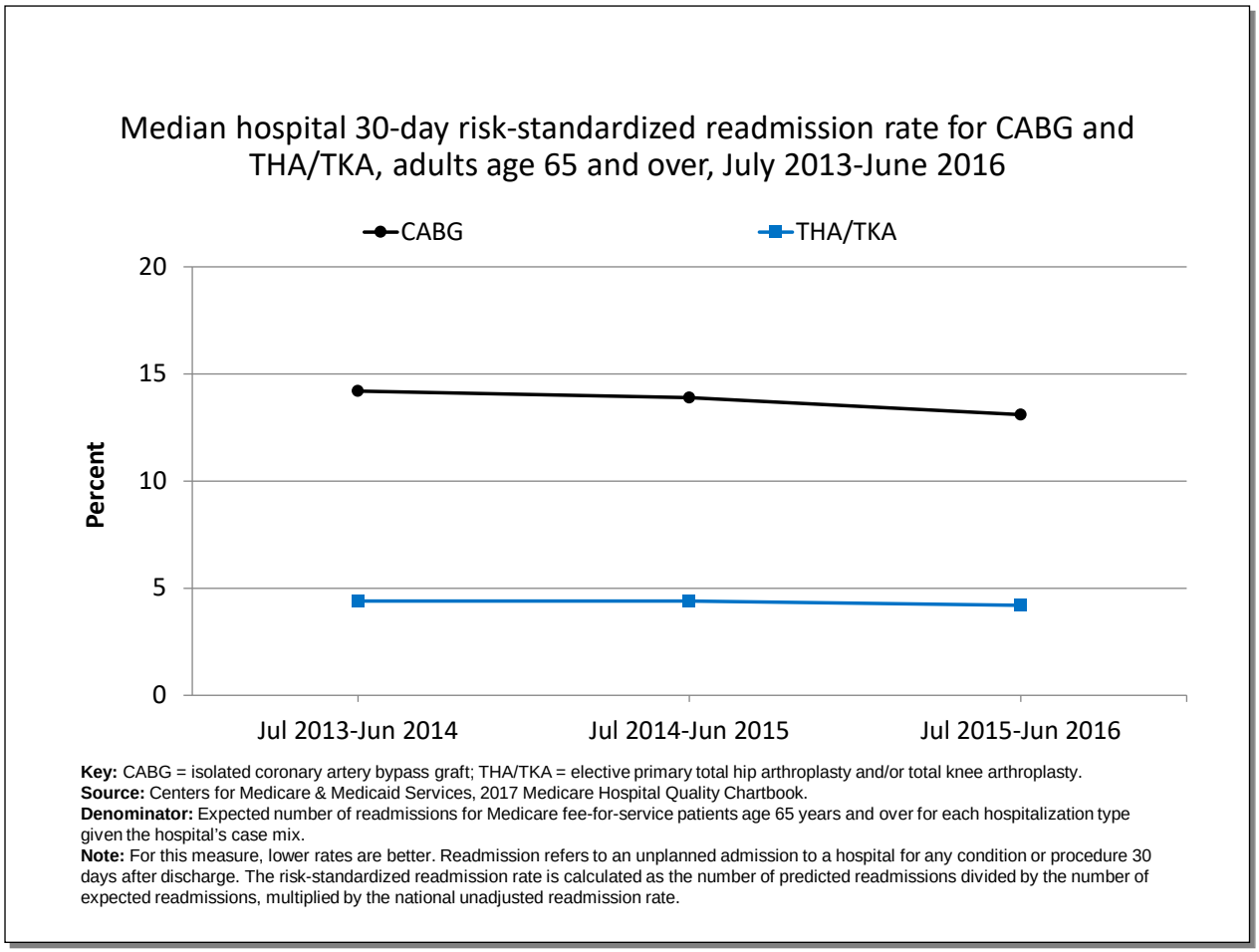
Hospital readmission shortly after discharge is a marker of inpatient quality of care and a significant contributor to rising healthcare costs.[16] In 2019, more than half of U.S. hospitals will face financial penalties from CMS because of excessive 30-day readmission rates after certain hospitalizations (e.g., coronary artery bypass graft).[17]

The full list of selected types of hospitalizations include acute myocardial infarction (AMI), heart failure (HF), pneumonia, chronic obstructive pulmonary disease (COPD), total hip arthroplasty/total knee arthroplasty (THA/TKA), and coronary artery bypass graft (CABG).

Measures of readmissions and complications shown in this chartbook follow:

- Readmissions
  - Median hospital 30-day risk-standardized readmission rate for CABG and THA/TKA, adults age 65 and over
  - Median hospital 30-day risk-standardized readmission rate for CABG and THA/TKA, by percentage of patients who are Black
  - Median hospital 30-day risk-standardized readmission rate for CABG and THA/TKA, by percentage of patients who have Medicaid
- Complications
  - Median hospital 30-day risk-standardized complication rate for THA/TKA, adults age 65 and over
  - Median hospital 30-day risk-standardized complication rate for THA/TKA, by percentage of patients who are Black and percentage of patients who have Medicaid

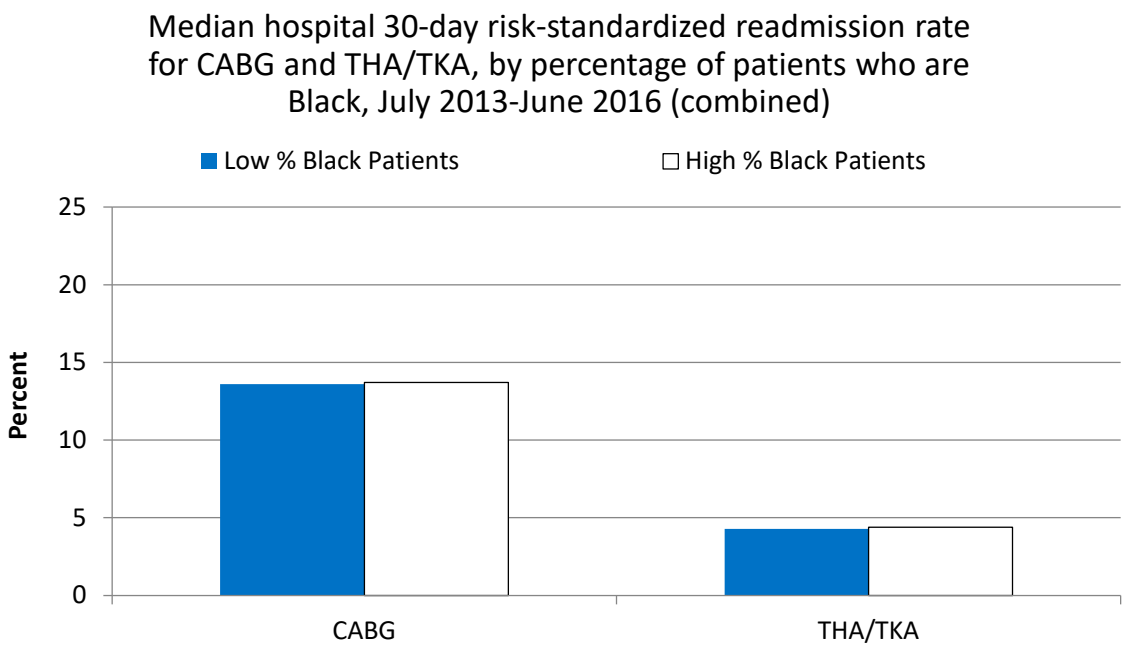
Readmissions for Bypass Surgery and Hip or Knee Replacement



Key: CABG = isolated coronary artery bypass graft; THA/TKA = elective primary total hip arthroplasty and/or total knee arthroplasty.
Source: Centers for Medicare & Medicaid Services, 2017 Medicare Hospital Quality Chartbook.
Denominator: Expected number of readmissions for Medicare fee-for-service patients age 65 years and over for each hospitalization type given the hospital's case mix.
Note: For this measure, lower rates are better. Readmission refers to an unplanned admission to a hospital for any condition or procedure 30 days after discharge. The risk-standardized readmission rate is calculated as the number of predicted readmissions divided by the number of expected readmissions, multiplied by the national unadjusted readmission rate.

- **Importance:** Although not all hospital readmissions are preventable, readmission rates may show whether a hospital is doing its best to deliver quality care, prevent complications, teach patients at discharge, and ensure that patients make a smooth transition to their home or another setting, such as a nursing home.
- **Overall Rate:** In the July 2015-June 2016 period, the median 30-day risk-standardized readmission rate was 13.1% among isolated coronary artery bypass graft (CABG) patients and 4.2% among elective primary total hip arthroplasty and/or total knee arthroplasty patients.
- **Trends:** No trend analysis was conducted because fewer than four data points were available. While no statistical testing was performed, the raw data show a slight decline in the risk-standardized readmission rate for CABG, which was 14.2% in the July 2013-June 2014 period and 13.1% in the July 2015-June 2016 period.

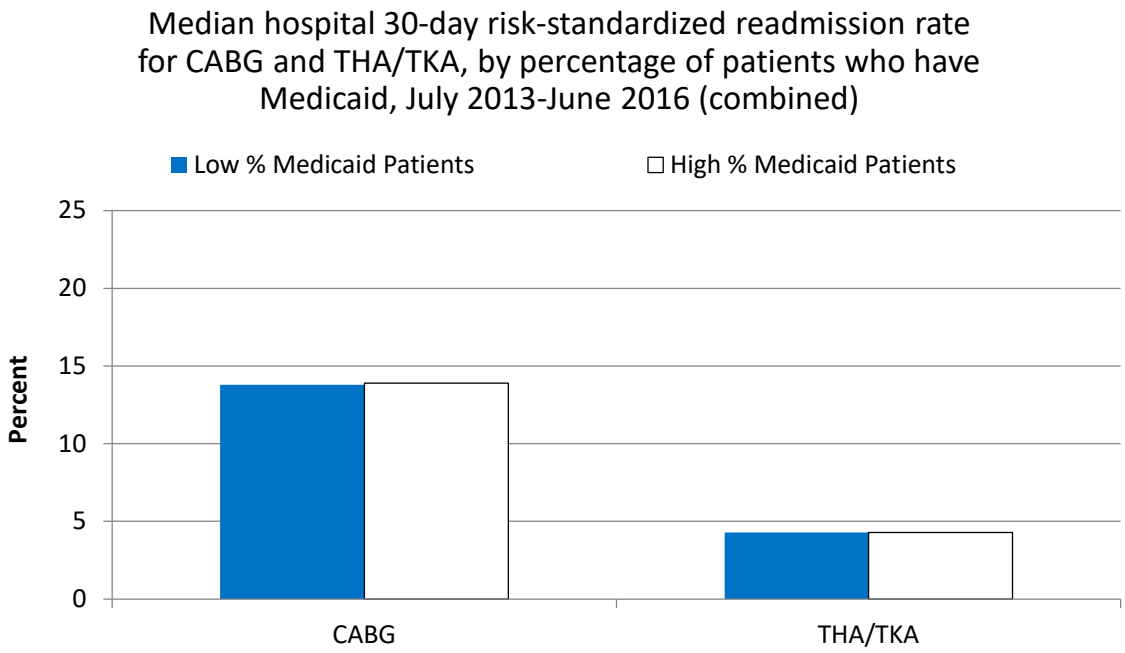
Readmissions for Bypass Surgery and Hip or Knee Replacement, by Percentage of Black Patients



Key: CABG = isolated coronary artery bypass graft; THA/TKA = elective primary total hip arthroplasty and/or total knee arthroplasty.
Source: Centers for Medicare & Medicaid Services, 2017 Medicare Hospital Quality Chartbook.
Denominator: Expected number of readmissions for Medicare fee-for-service patients age 65 years and over for each hospitalization type given the hospital's case mix.
Note: For this measure, lower rates are better. The risk-standardized readmission rate is calculated as the number of predicted readmissions divided by the number of expected readmissions, multiplied by the national unadjusted readmission rate. Readmission refers to an unplanned admission to a hospital for any condition or procedure 30 days after discharge. For CABG, low % Black patients is defined as ≤0.6% and high as ≥20.7%. For THA/TKA, low % Black patients is defined as ≤0.1% and high as ≥18.7%.

- **Importance:** Although not all hospital readmissions are preventable, readmission rates may show whether a hospital is doing its best to deliver quality care, prevent complications, teach patients at discharge, and ensure that patients make a smooth transition to their home or another setting, such as a nursing home.
- **Outcomes by Percentage of Black Patients:** The 2013 to 2016 median 30-day risk-standardized readmission rate for hospitals with high percentages of Black patients was higher for CABG (13.7%) than for THA/TKA (4.4%). These rates were similar to those for hospitals with low percentages of Black patients. No statistical tests were performed on these data.

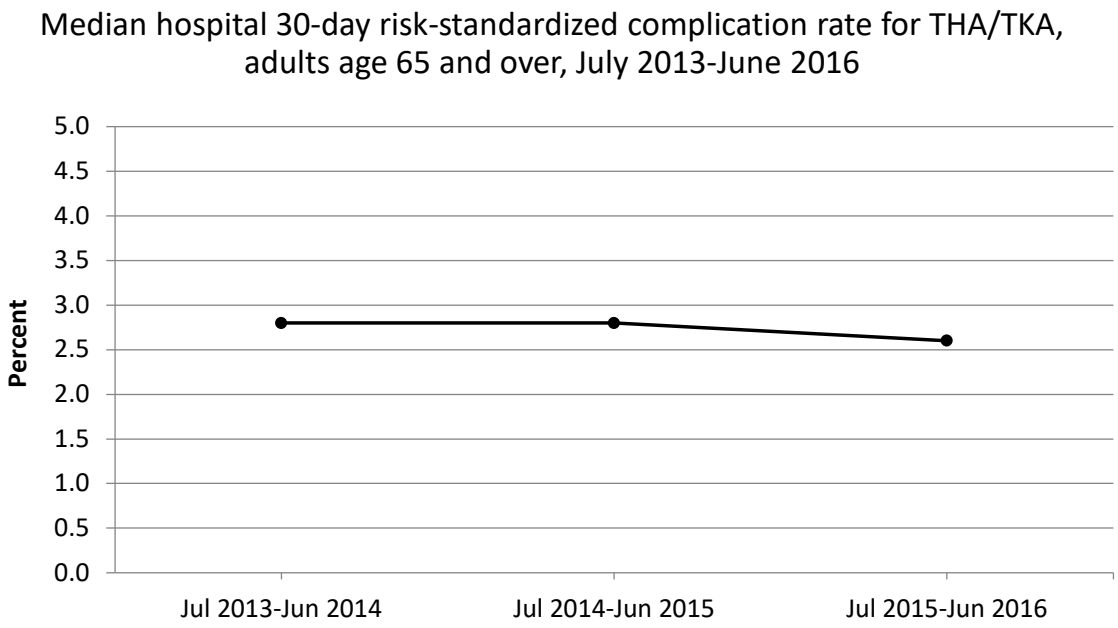
Readmissions for Bypass Surgery and Hip or Knee Replacement, by Percentage of Medicaid Patients



Key: CABG = isolated coronary artery bypass graft; THA/TKA = elective primary total hip arthroplasty and/or total knee arthroplasty.
Source: Centers for Medicare & Medicaid Services, 2017 Medicare Hospital Quality Chartbook.
Denominator: Expected number of readmissions for Medicare fee-for-service patients age 65 years and over for each hospitalization type given the hospital's case mix.
Note: For this measure, lower rates are better. The risk-standardized readmission rate is calculated as the number of predicted readmissions divided by the number of expected readmissions, multiplied by the national unadjusted readmission rate. Readmission refers to an unplanned admission to a hospital for any condition or procedure 30 days after discharge. For CABG, low % Medicaid patients is defined as ≤9.0% and high as ≥31.0%. For THA/TKA, low % Medicaid patients is defined as ≤7.3% and high as ≥31.0%.

- **Importance:** Although not all hospital readmissions are preventable, readmission rates may show whether a hospital is doing its best to deliver quality care, prevent complications, teach patients at discharge, and ensure that patients make a smooth transition to their home or another setting, such as a nursing home.
- **Outcomes by Percentage of Medicaid Patients:** The 2013 to 2016 median 30-day risk-standardized readmission rate for hospitals with high percentages of Medicaid patients was higher for CABG (13.9%) than for THA/TKA (4.3%). These rates were similar to those for hospitals with low percentages of Medicaid patients. No statistical tests were performed on these data.

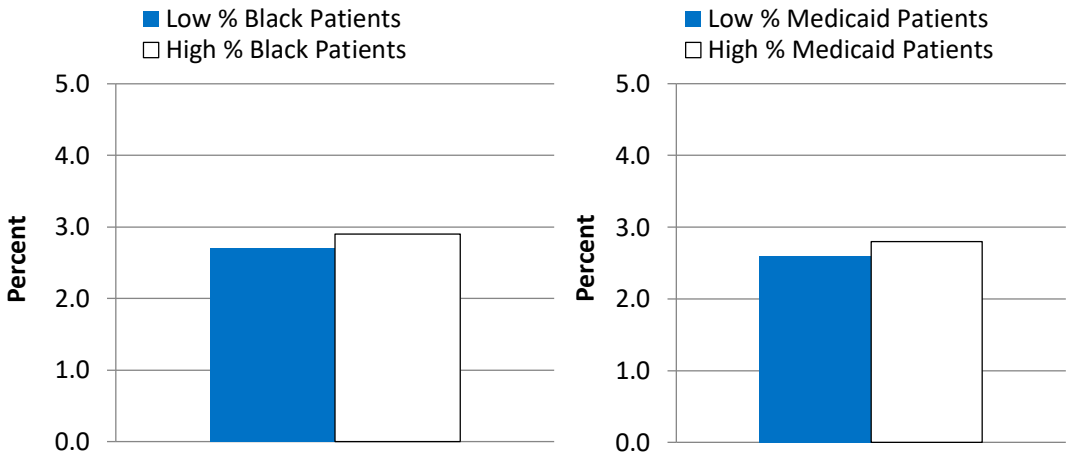
Complications of Hip or Knee Replacement



Key: THA/TKA = elective primary total hip arthroplasty and/or total knee arthroplasty.
Source: Centers for Medicare & Medicaid Services, 2017 Medicare Hospital Quality Chartbook.
Denominator: Expected number of readmissions for Medicare fee-for-service patients age 65 years and over for each hospitalization type given the hospital's case mix.
Note: For this measure, lower rates are better. The risk-standardized complication rate is calculated as the number of predicted complications divided by the number of expected complications, multiplied by the national unadjusted complication rate. Medical and surgical complications include acute myocardial infarction, pneumonia, or sepsis/septicemia during hospitalization or within 7 days from the date of admission; surgical site bleeding, pulmonary embolism, or death during the index admission or within 30 days from the date of the index admission; or mechanical complications, periprosthetic joint infection, or wound infection during the index admission or within 90 days from the date of the index admission.

- **Importance:** Although not all surgical complications are preventable, complication rates may show whether a hospital is doing its best to prevent complications.
- **Overall Rate:** In the July 2015-June 2016 period, the median 30-day risk-standardized complication rate was 2.6% among elective primary total hip arthroplasty and/or total knee arthroplasty patients.
- **Trends:** No trend analysis was conducted because fewer than four data points were available.

Complications of Hip or Knee Replacement, by Percentage of Black Patients and Medicaid Patients



Key: THA/TKA = elective primary total hip arthroplasty and/or total knee arthroplasty.
Source: Centers for Medicare & Medicaid Services, 2017 Medicare Hospital Quality Chartbook.
Denominator: Expected number of complications for Medicare fee-for-service patients age 65 years and over given the hospital's case mix.
Note: For this measure, lower rates are better. The risk-standardized complication rate is calculated as the number of predicted complications divided by the number of expected complications, multiplied by the national unadjusted complication rate. Medical and surgical complications include acute myocardial infarction, pneumonia, or sepsis/septicemia during hospitalization or within 7 days from the date of admission; surgical site bleeding, pulmonary embolism, or death during the index admission or within 30 days from the date of the index admission; or mechanical complications, periprosthetic joint infection, or wound infection during the index admission or within 90 days from the date of the index admission. Low % Black patients is defined as ≤0.1% and high as ≥18.5%. Low % Medicaid patients is defined as ≤7.3% and high as ≥30.8%.

- **Importance:** Although not all surgical complications are preventable, complication rates may show whether a hospital is doing its best to prevent complications.
- **Outcomes by Percentage of Black and Medicaid Patients:**
  - The 2013 to 2016 median 30-day risk-standardized complication rate following THA/TKA for hospitals with high percentages of Black patients was 2.9%, slightly higher than the 2.7% rate for hospitals with low percentages of Black patients.
  - The median 30-day risk-standardized complication rate following THA/TKA for hospitals with high percentages of Medicaid patients was 2.8%, slightly higher than the 2.6% rate for low percentages of Medicaid patients. No statistical tests were performed on these data.

Adverse Drug Events

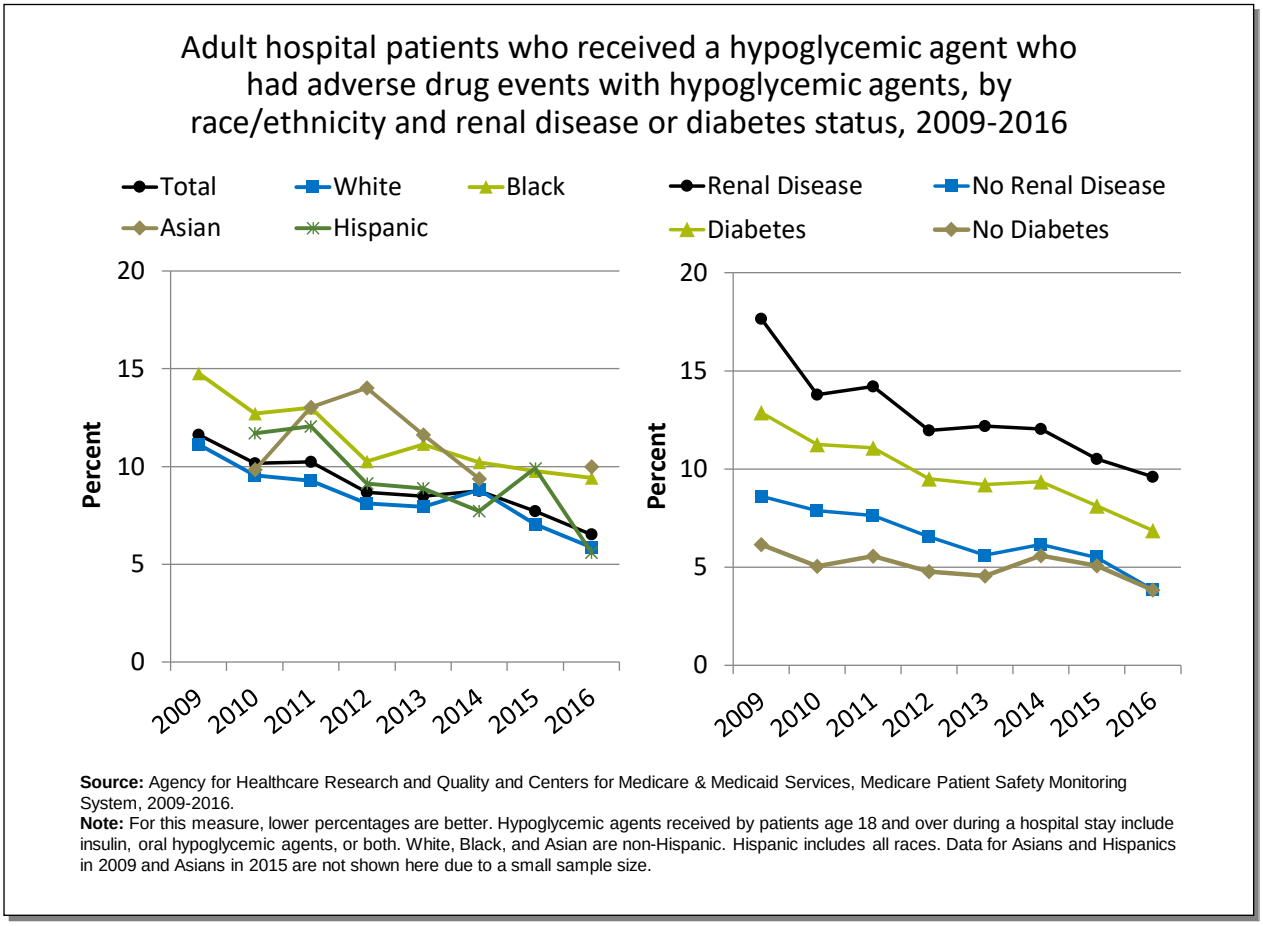
- An estimated 400,000 preventable ADEs occur each year in U.S. hospitals, generating additional costs of $3.5 billion.[18]
- The HHS National Action Plan for Adverse Drug Event Prevention targets three areas:
  - Bleeding related to use of anticoagulants
  - Hypoglycemia related to use of diabetic medications
  - Accidental overdose, oversedation, and respiratory depression related to use of opioids

An ADE is an injury—including physical harm, mental harm, or loss of function—resulting from medical intervention involving a drug. For more information, go to the Patient Safety Primer: Medication Errors and Adverse Drug Events at https://psnet.ahrq.gov/primers/primer/23/medication-errors. For more information on the HHS National Action Plan for Adverse Drug Event Prevention, refer to https://health.gov/hcq/ade-action-plan.asp.

Measures of ADEs shown in this chartbook follow:

- Hospitalized adult patients who received a hypoglycemic agent and had an adverse drug event
- Hospitalized adult patients who had an adverse drug event related to warfarin use
- Hospitalized patients with an anticoagulant-related adverse drug event to low-molecular-weight heparin (LMWH) or factor Xa inhibitor

Adverse Drug Events With Hypoglycemic Agents, by Race/Ethnicity and Disease Status

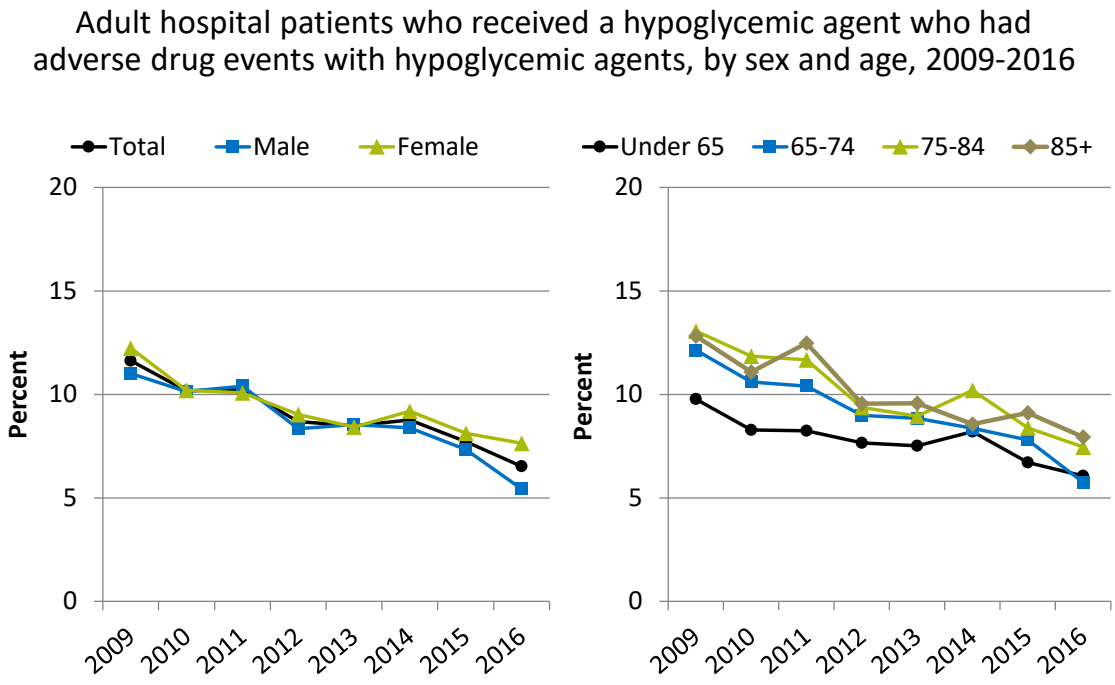


Source: Agency for Healthcare Research and Quality and Centers for Medicare & Medicaid Services, Medicare Patient Safety Monitoring System, 2009-2016.
Note: For this measure, lower percentages are better. Hypoglycemic agents received by patients age 18 and over during a hospital stay include insulin, oral hypoglycemic agents, or both. White, Black, and Asian are non-Hispanic. Hispanic includes all races. Data for Asians and Hispanics in 2009 and Asians in 2015 are not shown here due to a small sample size.

- **Importance:** Hypoglycemic agents ingested by mouth are typically used in patients with type 2 diabetes to control blood sugar levels. In some cases, diabetic patients use hypoglycemic agents together with insulin. The risk of chronic kidney disease increases for people with diabetes, and renal impairment can increase the risk of adverse events related to hypoglycemic agents.

- **Overall Percentage:** In 2016, 6.5% of hospital patients receiving hypoglycemic agents had an adverse drug event.
- **Trends:**
  - The overall percentage of adverse drug events associated with hypoglycemic agents fell from 11.6% in 2009 to 6.5% in 2016.
  - From 2009 to 2016, the percentage of patients experiencing an adverse drug event with hypoglycemic agents fell for Whites and Blacks. The percentage for Hispanics fell from 2010 to 2016. There was no statistically significant change for Asians.
  - No trend analysis was performed for rates stratified by renal disease or diabetes status.
- **Groups With Disparities:**
  - In 2016, the percentage of hospital patients who had adverse drug events with hypoglycemic agents was higher for Blacks (9.4%) than for Whites (5.9%).
  - In 2016, the percentage of hospital patients who had adverse drug events with hypoglycemic agents was higher for Asians (10.0%) than for Whites (5.9%).
  - In 2016, the percentage of hospital patients who had adverse drug events with hypoglycemic agents was higher for those with renal disease (9.6%) than for those without renal disease (3.9%).
  - Also in 2016, the percentage of hospital patients who had adverse drug events with hypoglycemic agents was higher for those with diabetes (6.9%) than for those without diabetes (3.8%).
- **Change in Disparities:** A disparity between Blacks and Whites existed in 2009 and did not significantly narrow over time.

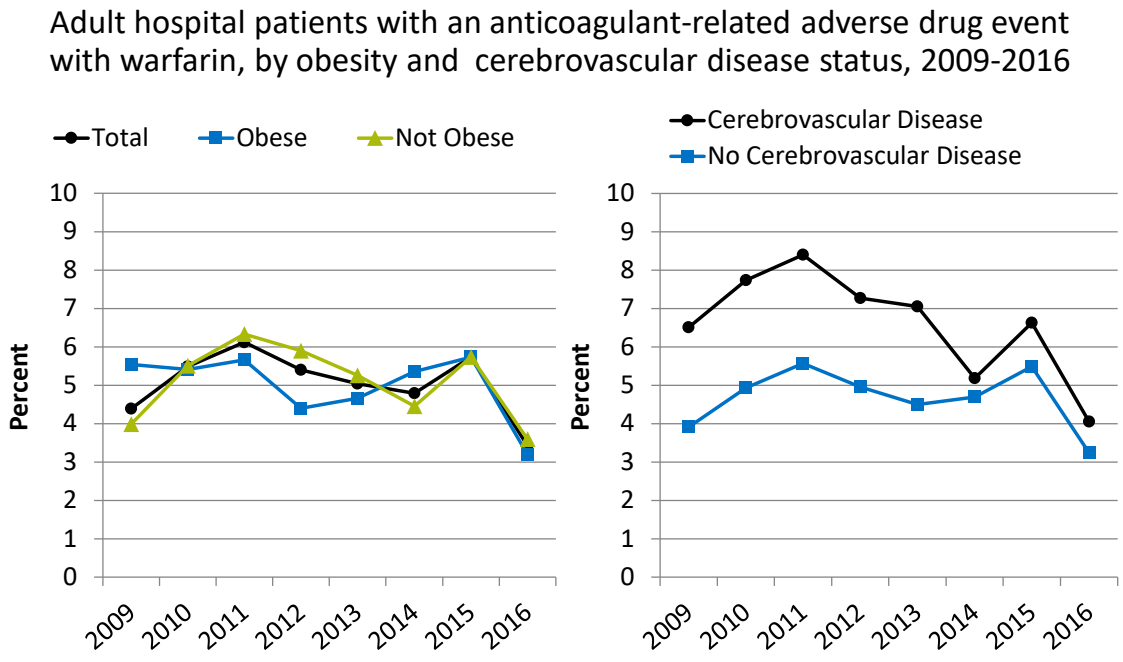
Adverse Drug Events With Hypoglycemic Agents, by Sex and Age



Source: Agency for Healthcare Research and Quality and Centers for Medicare & Medicaid Services, Medicare Patient Safety Monitoring System, 2009-2016.
Note: For this measure, lower percentages are better. Hypoglycemic agents received by patients age 18 and over during a hospital stay include insulin, oral hypoglycemic agents, or both.

- **Trends:**
  - From 2009 to 2016, the percentage of patients experiencing an adverse drug event with hypoglycemic agents fell for males and females.
  - Age-specific trends were not tested for statistical significance.
- **Groups With Disparities:**
  - In 2016, the percentage of hospital patients who had adverse drug events with hypoglycemic agents was higher for females (7.6%) than for males (5.4%).
  - In 2016, the percentage of hospital patients who had adverse drug events with hypoglycemic agents was higher for adults ages 75-84 (7.5%) and age 85 and over (7.9%) than for those ages 65-74 (5.8%).

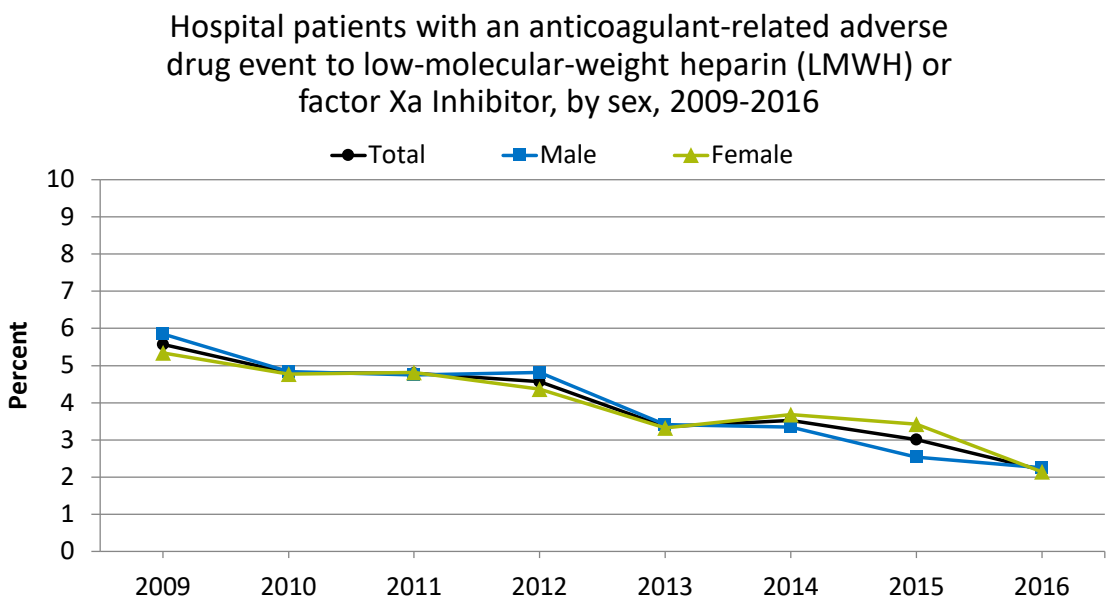
Adverse Drug Events With Warfarin



Source: Agency for Healthcare Research and Quality and Centers for Medicare & Medicaid Services, Medicare Patient Safety Monitoring System, 2009-2016.
Denominator: Patients 18 and over who received warfarin and had their international normalized ratio measured during their hospital stay.
Note: For this measure, lower percentages are better. Adverse events occurring the day of hospital arrival were excluded.

- **Importance:** Blood clots in arteries and veins can cause a blockage of blood flow and lead to strokes and heart attacks. Stroke survivors have an increased risk of another stroke, and obese individuals are at higher risk of blood clots. Anticoagulants, such as warfarin, reduce this risk but pose an increased risk of bleeding.
- **Overall Percentage:** In 2016, 3.4% of adult hospital patients using warfarin experienced an anticoagulant-related adverse drug event.
- **Trends:** From 2009 to 2016, there was no statistically significant change overall in the percentage of hospital patients with an adverse drug event related to warfarin. Trends for rates stratified by obesity status and cerebrovascular disease status were not tested for statistical significance.
- **Groups With Disparities:** In 2016, there were no statistically significant differences by obesity status or cerebrovascular disease status in the percentage of hospital patients who had an adverse drug event related to warfarin.

Adverse Drug Events With Low-Molecular-Weight Heparin, by Sex



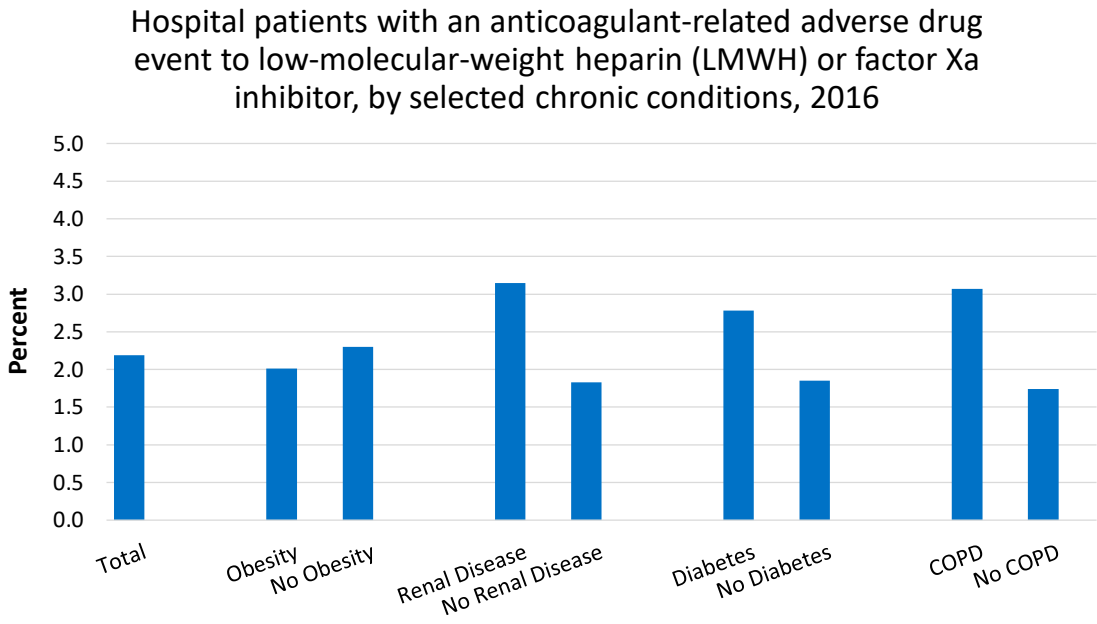
Source: Agency for Healthcare Research and Quality and Centers for Medicare & Medicaid Services, Medicare Patient Safety Monitoring System (MPSMS), 2009-2016.
Denominator: All patients from the MPSMS sample who received LMWH or factor Xa inhibitor during the index hospital stay.
Numerator: A subset of the denominator who experienced:

- Abrupt cessation/hold of LMWH or factor Xa with one of the following: cardiac arrest/emergency measures to sustain life, death, gastrointestinal bleeding, genitourinary bleeding, hematocrit drop of 3 or more points more than 48 hours after admission, intracranial bleeding (subdural hematoma), new hematoma, pulmonary bleeding, or other types of bleeding.
- Administration of protamine or fresh frozen plasma with one or more of the above symptoms.
- Blood transfusion (absent a surgical procedure) with one or more of the above symptoms.

Note: For this measure, lower percentages are better.

- **Importance:** Low-molecular-weight heparin (LMWH) and factor Xa inhibitors are widely used to prevent and treat venous thromboembolism and acute coronary syndromes. Although these drugs have been shown to improve outcomes, adverse events associated with bleeding remain a concern, and there are uncertainties about safety for specific patient populations, including pregnant women.[19,20]
- **Overall Percentage:** In 2016, 2.2% of patients who received LMWH or factor Xa inhibitor during an index hospital stay experienced an anticoagulant-related adverse event.
- **Groups With Disparities:** No gender disparity was found in 2016.

Adverse Drug Events With Low-Molecular-Weight Heparin, by Chronic Condition



Key: COPD = chronic obstructive pulmonary disease.
Source: Agency for Healthcare Research and Quality and Centers for Medicare & Medicaid Services, Medicare Patient Safety Monitoring System (MPSMS), 2016.
Denominator: All patients from the MPSMS sample who received LMWH or factor Xa inhibitor during the index hospital stay.
Numerator: A subset of the denominator who experienced:

- Abrupt cessation/hold of LMWH or factor Xa with one of the following: cardiac arrest/emergency measures to sustain life, death, gastrointestinal bleeding, genitourinary bleeding, hematocrit drop of three or more points more than forty eight hours after admission, intracranial bleeding (subdural hematoma), new hematoma, pulmonary bleeding, or other types of bleeding.
- Administration of protamine or fresh frozen plasma with one or more of the above symptoms.
- Blood transfusion (absent a surgical procedure) with one or more of the above symptoms.

Note: For this measure, lower percentages are better.

- **Importance:** Low-molecular-weight heparin (LMWH) and factor Xa inhibitors are widely used to prevent and treat venous thromboembolism and acute coronary syndromes. There are concerns about correct dosages for these drugs among morbidly obese patients and about their effects on pregnant patients and those with renal disease.[19,21]
- **Groups With Disparities:**
  - There was no statistically significant difference in the frequency of anticoagulant-related adverse events between obese patients and those who were not obese (2.0% vs. 2.3%).
  - Patients with renal disease were more likely to experience anticoagulant-related adverse events than those without renal disease (3.2% vs. 1.8%).
  - Diabetic patients were more likely to experience anticoagulant-related adverse events than those without diabetes (2.8% vs. 1.9%).
  - Patients with COPD were more likely to experience anticoagulant-related adverse events than those without COPD (3.1% vs. 1.7%).

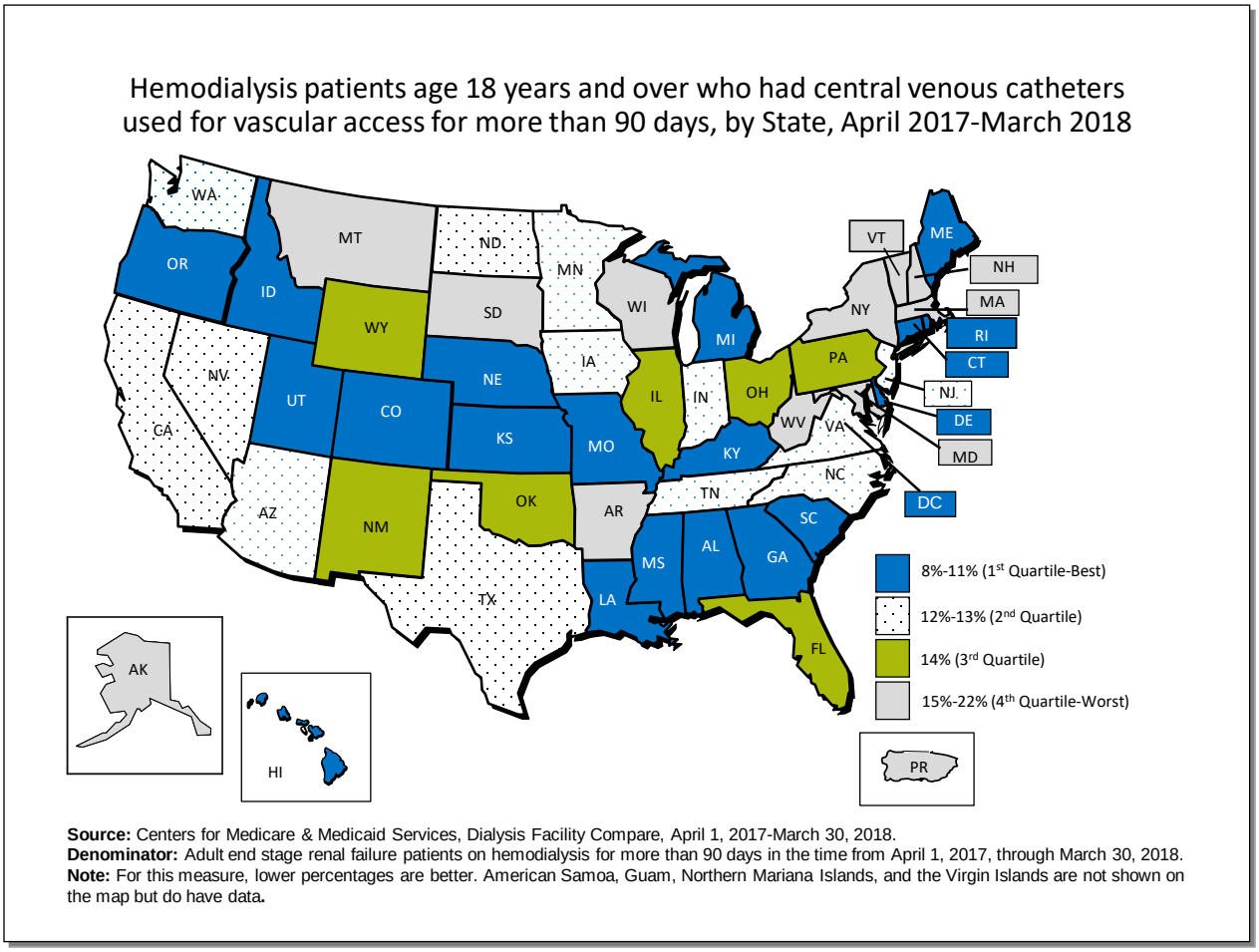
Patient Safety in the Ambulatory Setting

Although patient safety initiatives frequently focus on inpatient hospital events, adverse effects of medical care may be identified and treated in outpatient settings. Adverse effects of medical care can follow ambulatory care or procedures provided in hospitals, emergency departments, physician offices, or other settings. More information is in the Patient Safety Primer: Ambulatory Care Safety at https://psnet.ahrq.gov/primers/primer/16/patient-safety-in-ambulatory-care.

Measures of patient safety in the ambulatory setting shown in this chartbook follow:

- Hemodialysis patients age 18 years and over who had central venous catheters used for vascular access for more than 90 days
- Adults age 65 and over who received during the calendar year at least 1 of 33 potentially inappropriate prescription medications
- Doctor's office, emergency department, and outpatient department visits where antibiotics were prescribed for a diagnosis of common cold per 10,000 population

Extended Central Venous Catheter Use in Dialysis Patients



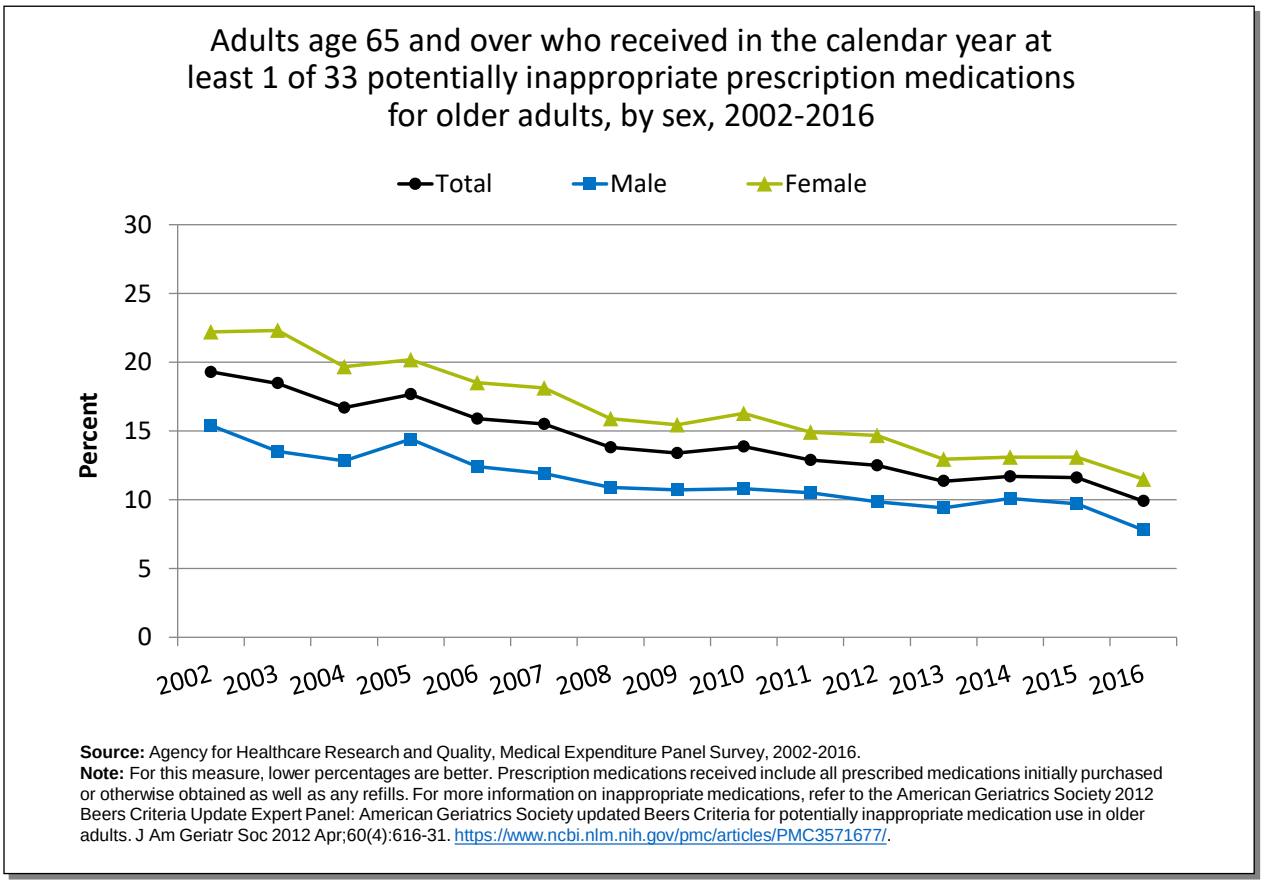
Source: Centers for Medicare & Medicaid Services, Dialysis Facility Compare, April 1, 2017-March 30, 2018.
Denominator: Adult end stage renal failure patients on hemodialysis for more than 90 days in the time from April 1, 2017, through March 30, 2018.
Note: For this measure, lower percentages are better. American Samoa, Guam, Northern Mariana Islands, and the Virgin Islands are not shown on the map but do have data.

- **Importance:** In hemodialysis patients, central venous catheters (CVCs) are frequently used for vascular access until a fistula or graft is ready for use. Compared with other forms of vascular access for hemodialysis, CVC use is associated with higher rates of infection and other adverse events.[22] To decrease the likelihood of adverse events, CVCs should be used for 90 days or less.
- **Overall Percentage:** Nationally, among adult end stage renal disease patients on any form of hemodialysis for 90 or more days during the observation period of April 1, 2017, through March 31, 2018, an average of 13% used CVCs for more than 90 days (data not shown).
- **Differences by State:** Percentages for State-equivalent jurisdictions and U.S. territories were provided as whole numbers (with multiple tied values). Therefore, the quartiles have varying numbers of States, and ranges are approximate. The States and territories are listed in alphabetical order:

  - First quartile (best performers): 8%-11% (AL, CO, CT, DC, DE, GA, GU, HI, ID, KS, KY, LA, ME, MI, MO, MS, NE, OR, RI, SC, UT)
  - Second quartile: 12%-13% (AZ, CA, IA, IN, MN, MP, NC, ND, NJ, NV, TN, TX, VA, WA)
  - Third quartile: 14% (FL, IL, NM, OH, OK, PA, WY)
  - Fourth quartile (worst performers): 15%-22% (AK, AR, AS, MA, MD, MT, NH, NY, PR, SD, VI, VT, WI, WV)

  The differences among States have not been assessed for statistical significance.

Inappropriate Medication Prescriptions for Older Adults, by Sex



Source: Agency for Healthcare Research and Quality, Medical Expenditure Panel Survey, 2002-2016.
Note: For this measure, lower percentages are better. Prescription medications received include all prescribed medications initially purchased or otherwise obtained as well as any refills. For more information on inappropriate medications, refer to the American Geriatrics Society 2012 Beers Criteria Update Expert Panel: American Geriatrics Society updated Beers Criteria for potentially inappropriate medication use in older adults. J Am Geriatr Soc 2012 Apr;60(4):616-31. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3571677/.

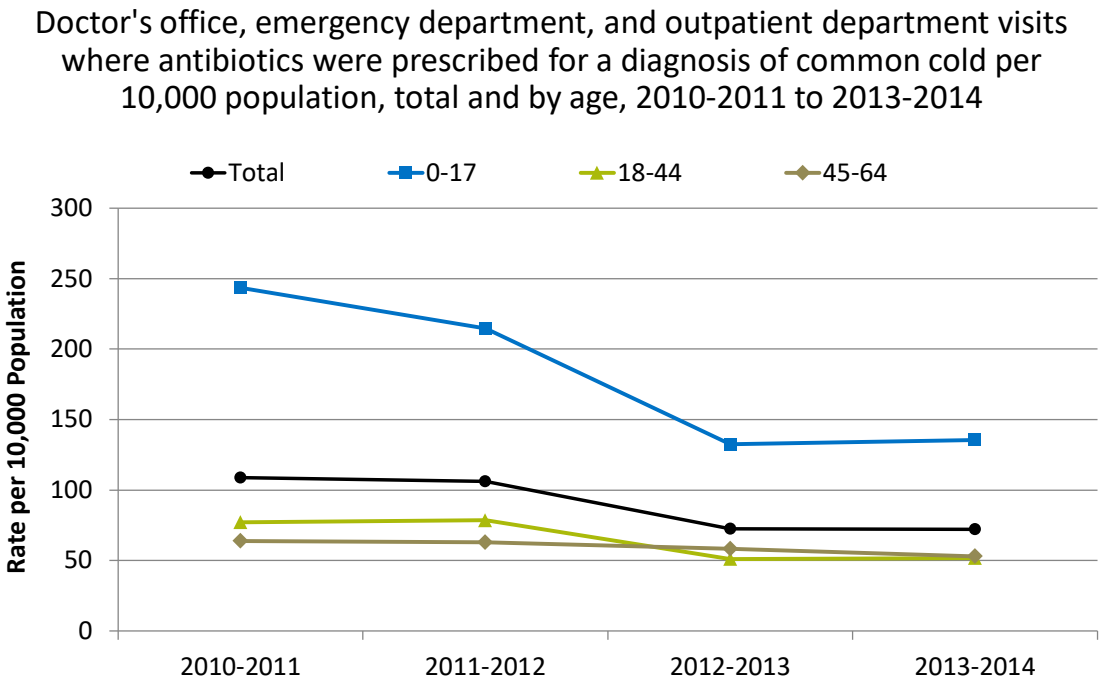
- **Importance:** Some drugs that are prescribed for older patients are known to be potentially harmful for this age group.
- **Overall Percentage:** In 2016, 9.9% of adults age 65 years and over received potentially inappropriate prescription medications.
- **Trends:** From 2002 to 2016, the percentage of adults age 65 years and over who received potentially inappropriate prescription medications improved overall and for both sexes.
- **Groups With Disparities:** In all years, the percentage of patients receiving potentially inappropriate medications was higher among females than males. This gap has not narrowed significantly over time.

Inappropriate Medication Prescriptions for Older Adults, by Perceived Health Status

Source: Agency for Healthcare Research and Quality, Medical Expenditure Panel Survey, 2002-2016.
Note: For this measure, lower percentages are better. Prescription medications received include all prescribed medications initially purchased or otherwise obtained as well as any refills. For more information on inappropriate medications, refer to the American Geriatrics Society 2012 Beers Criteria Update Expert Panel: American Geriatrics Society updated Beers Criteria for potentially inappropriate medication use in older adults. J Am Geriatr Soc 2012 Apr;60(4):616-31. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3571677/.

- **Importance:** Some drugs that are prescribed for older patients are known to be potentially harmful for this age group.
- **Groups With Disparities:** In all years, the percentage of patients receiving potentially inappropriate medications was higher among people with fair/poor health status compared with people with excellent/very good/good health status.

Use of Antibiotics for Common Cold



Source: Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Ambulatory Medical Care Survey and National Hospital Ambulatory Medical Care Survey, 2010-2014
Denominator: 2000-based postcensal estimates of the civilian noninstitutionalized population as of July 1 of each data year.
Note: For this measure, lower rates are better.

- **Importance:** The inappropriate use of antibiotics has substantial patient safety implications, including the development of antibiotic resistance without corresponding clinical benefit and unnecessary exposure of patients to the risk of adverse reactions to the antibiotics. The high volume of cases of inappropriate use of antibiotics also results in higher and unnecessary costs for care.
- **Definition:** Colds were identified as a primary diagnosis of any of the following International Classification of Diseases, Ninth Revision codes: Acute nasopharyngitis [common cold] (460), Chronic rhinitis (472.0), Acute laryngopharyngitis (465.0), Acute upper respiratory infections of other multiple sites (465.8), and Acute upper respiratory infections of unspecified site (465.9). Data for age 65 and over do not meet the criteria for statistical reliability, data quality, or confidentiality and are not included.
- **Overall Rate:** In 2013-2014, the rate of doctor's office, emergency department, and outpatient department visits where antibiotics were prescribed for a diagnosis of common cold was 72.1 per 10,000 population.
- **Trend:** The rate was improving over time, from 108.8 in 2010-2011 to 72.1 in 2013-2014.

- **Groups With Disparities:**
  - In 2013-2014, the rate of antibiotics prescribed for a diagnosis of common cold in doctor's office, emergency department, and outpatient department visits was higher for patients ages 0-17 (135.4 per 10,000 population) than for the reference group, patients ages 18-44 (51.6 per 10,000 population).
  - In all years, patients ages 0-17 were more likely to be prescribed antibiotics for a cold than patients ages 18-44, but this gap has narrowed over time.

- **Improvement Efforts:** The data shown here predate and therefore do not reflect the impact of recent concentrated national efforts to improve antibiotic management, including:
  - The 2015 National Action Plan for Combating Antibiotic-Resistant Bacteria,
  - The Centers for Disease Control and Prevention campaign to reduce unnecessary antibiotic use and subsequent revisions of primary care, specialty, and hospital guidelines regarding the appropriate use of antibiotics. See, for example, Antibiotic Use in the United States, 2017: Progress and Opportunities. https://www.cdc.gov/antibiotic-use/stewardship-report/outpatient.html.

AHRQ Supported Resource To Improve Patient Safety in Ambulatory Settings

- **Purpose:** To actively engage patients and their care partners to prevent errors during transitions of care
- **Methods:** Implement the Toolkit To Engage High-Risk Patients in Safe Transitions Across Ambulatory Settings
- **Intended users:** Primary care office managers and providers
- **Available tools:**
  - Implementation guide
  - Preintervention assessment of current practices to identify gaps
  - Patient appointment aid to encourage patients to ask questions and communicate needs and preferences
  - Checklist for clinicians to help them prepare patients for new healthcare appointments
  - Educational training video for clinicians

- **Link:** https://www.ahrq.gov/professionals/quality-patient-safety/hais/tools/ambulatory-care/safetransitions.html
- **Patient safety measures that could be directly affected by implementation of this toolkit by ambulatory care providers include:**
  - Adults age 65 and over who received in the calendar year at least 1 of 11 prescription medications that should be avoided in older adults.
  - Adults age 65 and over who received in the calendar year at least 1 of 33 potentially inappropriate prescription medications for older adults.
  - Short-stay home health patients who had drug education on all medications.

- **Patient safety measures that could be indirectly affected by implementation of this toolkit by ambulatory care providers who share information with home health providers include:**

  - Adults who reported a home health provider talking with them about all the prescription and over-the-counter medicines they were taking when they first started getting home health care.
  - Adults who reported a home health provider asking to see all the prescription and over-the-counter medicines they were taking, when they first started getting home health care.
  - Adults who reported that home health providers talked with them in the last 2 months of care about the purpose of taking their new or changed prescription medicines.

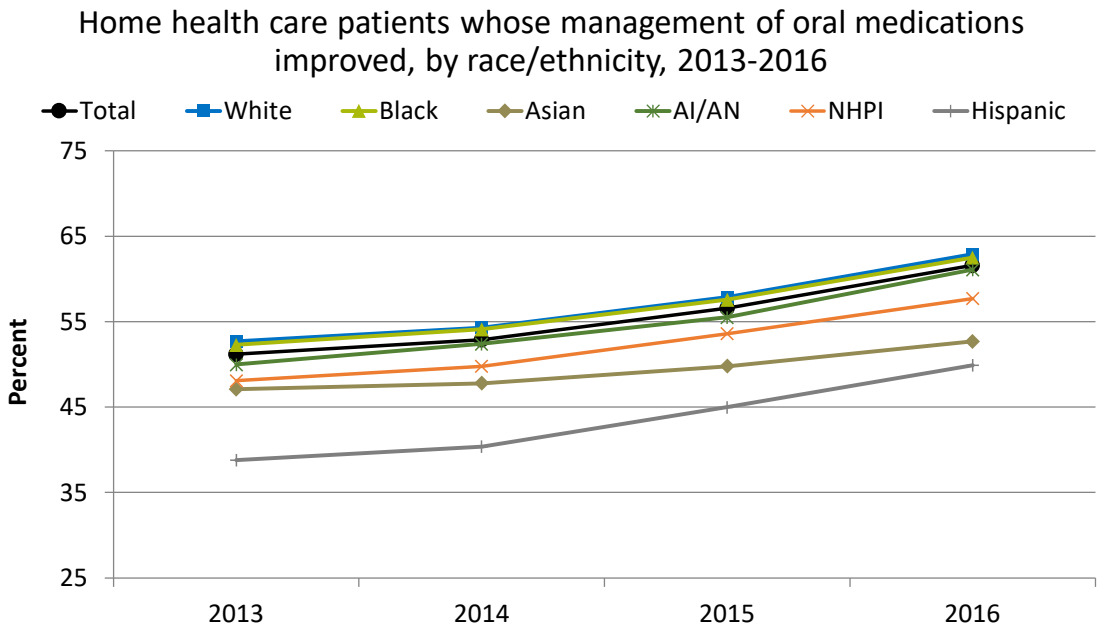
Patient Safety in the Home Health Setting

Home health agencies provide services to beneficiaries who are homebound and need skilled nursing care or therapy. Approximately 12 million individuals receive home health care from more than 33,000 providers for causes including acute illness, long-term health conditions, permanent disability, and terminal illness.[23] Improvements among home health patients can reflect the quality of care from home health agencies.

Measures of patient safety in the home health setting shown in this chartbook follow:

- Home health care patients whose management of oral medications improved, by race/ethnicity
- Adults who reported a home health provider asking to see all the prescription and over-the-counter medicines they were taking, when they first started getting home health care, by race/ethnicity and age

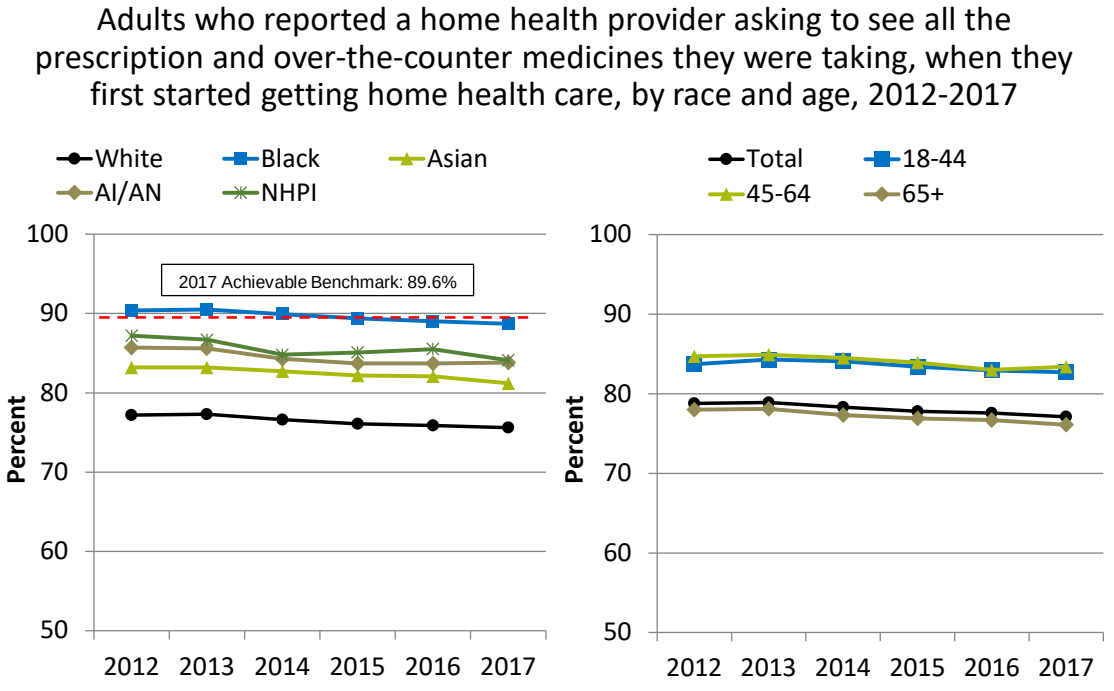
Management of Oral Medications



Key: AI/AN = American Indian or Alaska Native; NHPI = Native Hawaiian/Pacific Islander.
Source: Centers for Medicare & Medicaid Services, Outcome and Assessment Information Set.
Denominator: All valid home health care episodes that begin in the survey year, excluding episodes for patients not taking oral medications, patients initially able to take oral medications correctly without assistance or supervision, nonresponsive patients, and patients with missing medication management data.
Note: White, AI/AN, Asian, Black, and NHPI are non-Hispanic. Hispanic includes all races. Measure includes a subset of the denominator in which a person showed improvement in ability to manage oral medications compared with a prior assessment during an episode of care. Management is measured on a 4-level scale from 0 (fully independent) to 3 (entirely dependent) and refers to ability, not medication compliance. Further information about Home Health Quality Initiative measures is available at http://www.cms.hhs.gov/HomeHealthQualityInits/.

- **Importance:** Poor medication management may lead to incorrect, missed, and mistimed doses, reducing the effectiveness of medical treatment plans, making adverse events more likely, and potentially leading to hospitalization, injury, or death.
- **Overall Percentage:** In 2016, 61.6% of home health patients taking oral medications had improved their medication management during an episode of care.
- **Trends:** From 2013 to 2016, medication management improved for patients overall, for men and women (data not shown), and for all racial/ethnic groups.
- **Groups With Disparities:**
  - In 2016, Hispanics fared significantly worse than Whites (49.9% vs. 62.9%).
  - Hispanics also fared worse than Whites in 2013, and the disparity did not improve significantly over time.
  - In 2016, Asians fared worse than Whites (52.7% vs. 62.9%).
  - Asians also fared worse than Whites in 2013, and the disparity between Asians and Whites worsened over time.
  - In 2016, NHPIs fared worse than Whites (57.7% vs. 62.9%).

Home Health Providers Asking To See Patients' Medicines



Key: AI/AN = American Indian or Alaska Native; NHPI: Native Hawaiian/Pacific Islander.
Source: Centers for Medicare & Medicaid Services, Consumer Assessment of Healthcare Providers and Systems Home Health Care (HHCAHPS) Survey.
Denominator: Adult home health patients age 18 and over who provided a valid response to the question, "When you first started getting home health care from this agency, did someone from the agency ask to see all the prescription and over-the-counter medicines you are taking?" excluding non-respondents and respondents who "do not remember."
Note: White, Black, Asian, AI/AN, and NHPI are non-Hispanic. Hispanic includes all races.

- **Importance:**
  - Home health providers' asking to see all medications is a preliminary step in ensuring that patients take only medications appropriate to their condition and understand why, when, and how much of each medication to take. This step may be especially important in protecting against medication errors and adverse events after transitions from facility-based care to home care.
  - This measure focuses on patients' recollection of their experience with the home health agency. It is important to note that the skill sets and required background training of home health care workers varies substantially across States. While home health care workers in some States may be trained to assist providers in medication reconciliation, workers in other States may not. Medication reconciliation is a key part of ambulatory care. For more information, go to the Patient Safety Primer: Ambulatory Care Safety at https://psnet.ahrq.gov/primers/primer/16.

- **Overall Percentage:** In 2017, 77.1% of adult home health patients reported that they had been asked to show a home health provider all the prescription and over-the-counter medicines they were taking, when they first started getting home health care.

- **Trends:**
  - From 2012 to 2017, the percentage of home health patients reporting that they had been asked to show their medications to a home health provider decreased from 78.8% to 77.1%.
  - Similar decreases were observed for all racial and age groups.
  - The percentage for Black patients worsened but remained above the top 5 State achievable benchmark of 85.5%. The States and territories contributing to the benchmark are Alabama, Guam, Louisiana, Mississippi, and Virgin Islands.
  - The percentage for Hispanics also worsened over time but remained above the benchmark (data not shown).

- **Groups With Disparities in 2017:**
  - Black, Asian, AI/AN, and NHPI home health patients were all more likely than White patients to have been asked to show their medications to a home health provider (88.7%, 81.2%, 83.8%, and 84.1%, respectively, vs. 75.6%).
  - Hispanic home health patients were more likely than non-Hispanic White patients to have been asked to show their medications to a home health provider (87.0% vs. 74.9%; data not shown).
  - Adults age 65 and over were less likely than adults ages 18-44 to have been asked to show their medications to a home health provider (76.1% vs 82.7%). This disparity existed in 2012 and has not narrowed over time.

Patient Safety Infrastructure: All Settings

Patient safety infrastructure varies by State and healthcare facility. Patient safety and quality issues in nursing homes and community pharmacies relative to safety culture are described in data from the:

- AHRQ Nursing Home Survey on Patient Safety Culture (Nursing Home SOPS™).
- AHRQ Community Pharmacy Survey on Patient Safety Culture (Pharmacy SOPS™).

AHRQ also regulates the Patient Safety Organizations program.

The AHRQ Nursing Home Survey on Patient Safety Culture (https://www.ahrq.gov/sops/surveys/nursing-home/index.html) enables nursing homes to assess how their staff perceive various aspects of patient safety culture in their nursing home.

The AHRQ Community Pharmacy Survey on Patient Safety Culture (https://www.ahrq.gov/sops/databases/pharmacy/index.html) enables community pharmacies to assess how their staff perceive various aspects of patient safety culture in their community pharmacy.

AHRQ created the Patient Safety Organization Privacy Protection Center (PSOPPC) (https://www.psoppc.org/psoppc_web/publicpages/about) to support implementation of the Patient Safety and Quality Improvement Act (PL-109-41; Patient Safety Act) passed by Congress in July 2005.

Surveys on Patient Safety Culture™ Nursing Home Survey

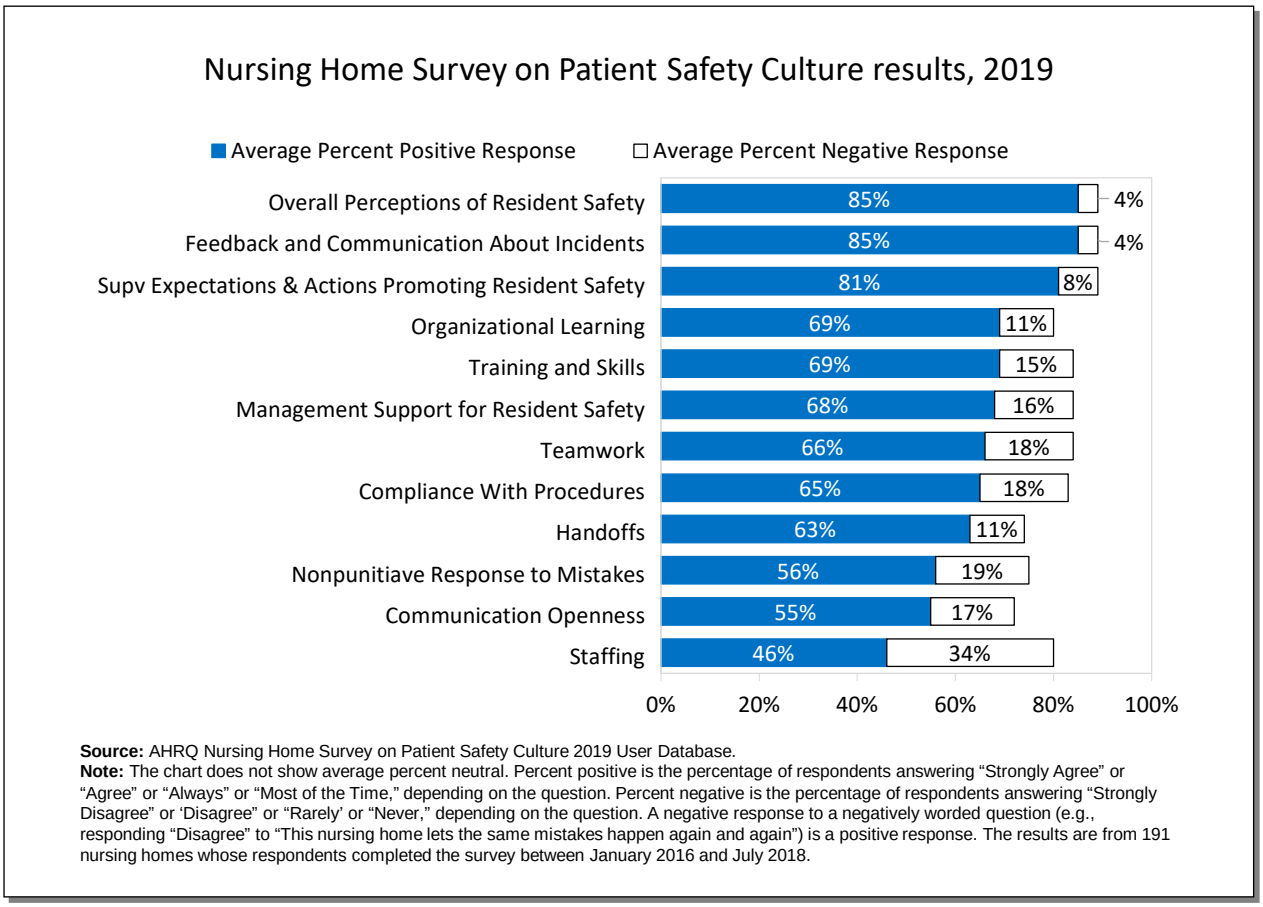
- **Data source:** AHRQ 2019 SOPS Nursing Home Database[24]
- **Results provided for:**
  - Nursing home patient safety culture composite measures
  - Willingness to recommend nursing home single item measure
  - Overall rating on resident safety single item measure
- **Sample characteristics:**
  - Self-selected sample of U.S. nursing homes
  - Responses submitted between January 2016 and July 2018 from 10,499 staff members representing 191 nursing homes

A nursing home is a facility or a special contained area of a facility that has only licensed nursing home beds and is not an assisted living, community care, or independent living facility. To be included in the Nursing Home Survey, nursing homes must be located in the United States or in a U.S. territory. Each nursing home must have at least 10 completed surveys. Only current nursing home employees are eligible to contribute data.

Nursing homes, systems/chains, or survey vendors that have administered the AHRQ *Nursing Home Survey on Patient Safety Culture* indicate their interest in participating in the database by registering with AHRQ; interested submitters are notified regarding their eligibility for participation. More information on the survey is available at https://www.ahrq.gov/sops/databases/nursing-home/databases/submission.html.

To determine the total number of nursing homes in the United States, the SOPS team reviewed CMS's Nursing Home Compare datasets website and identified 15,613 nursing homes. Refer to the CMS Nursing Home Compare datasets at https://data.medicare.gov/data/nursing-home-compare.

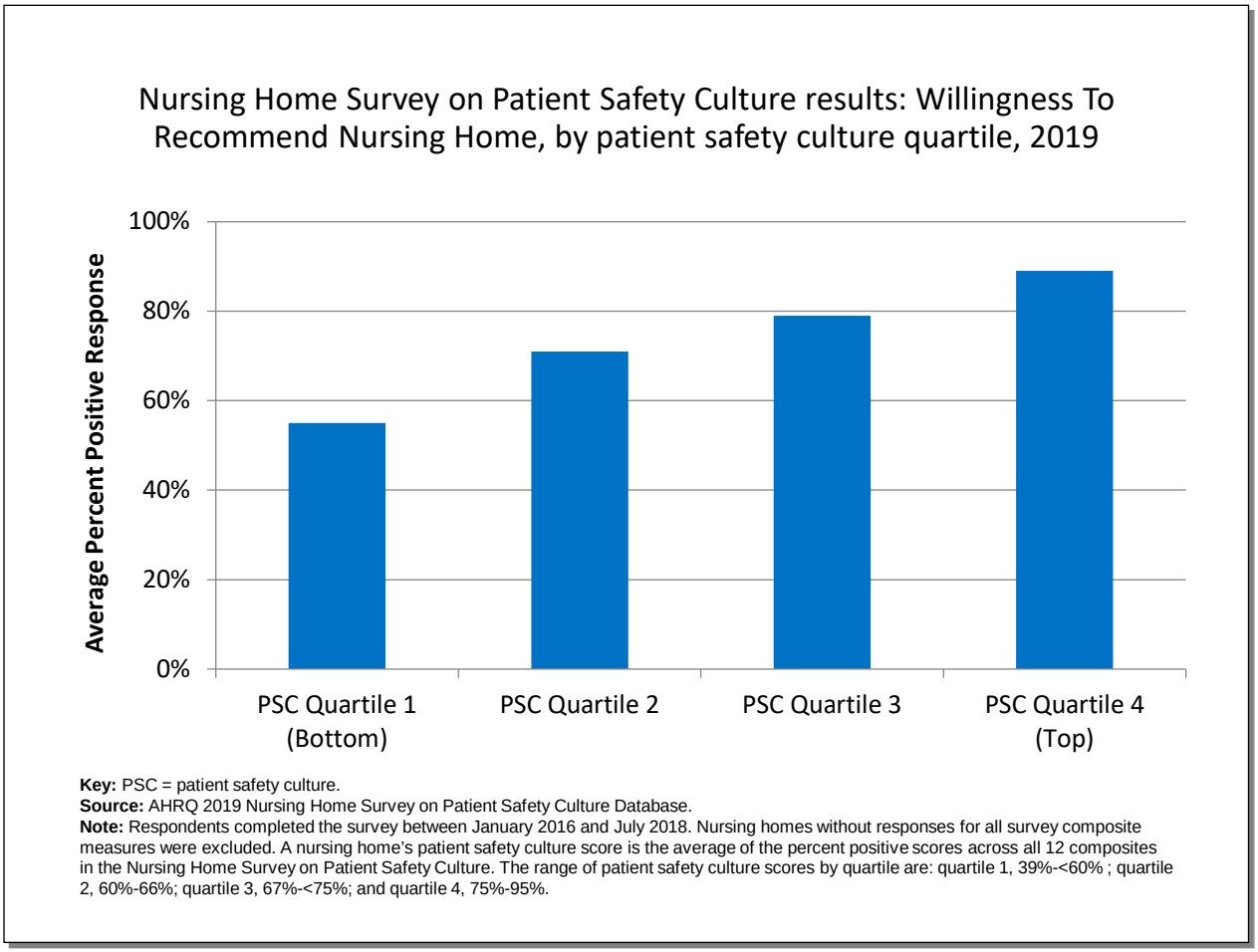
Nursing Home Survey Results



Source: AHRQ Nursing Home Survey on Patient Safety Culture 2019 User Database.
Note: The chart does not show average percent neutral. Percent positive is the percentage of respondents answering "Strongly Agree" or "Agree" or "Always" or "Most of the Time," depending on the question. Percent negative is the percentage of respondents answering "Strongly Disagree" or 'Disagree" or "Rarely' or "Never," depending on the question. A negative response to a negatively worded question (e.g., responding "Disagree" to "This nursing home lets the same mistakes happen again and again") is a positive response. The results are from 191 nursing homes whose respondents completed the survey between January 2016 and July 2018.

- **Importance**: As nursing homes aim to improve their performance, there is growing recognition of the importance of establishing a culture of patient safety by looking at patient safety culture areas where they are most positive and where they are perceived most negative by nursing home staff.
- **Areas of Strength and Weakness:**
  - Overall Perceptions of Resident Safety (85%) and Feedback and Communication About Incidents (85%) had the highest average percent positive responses.
  - Staffing (34%) and Nonpunitive Response to Mistakes (19%) had the highest percent negative responses.

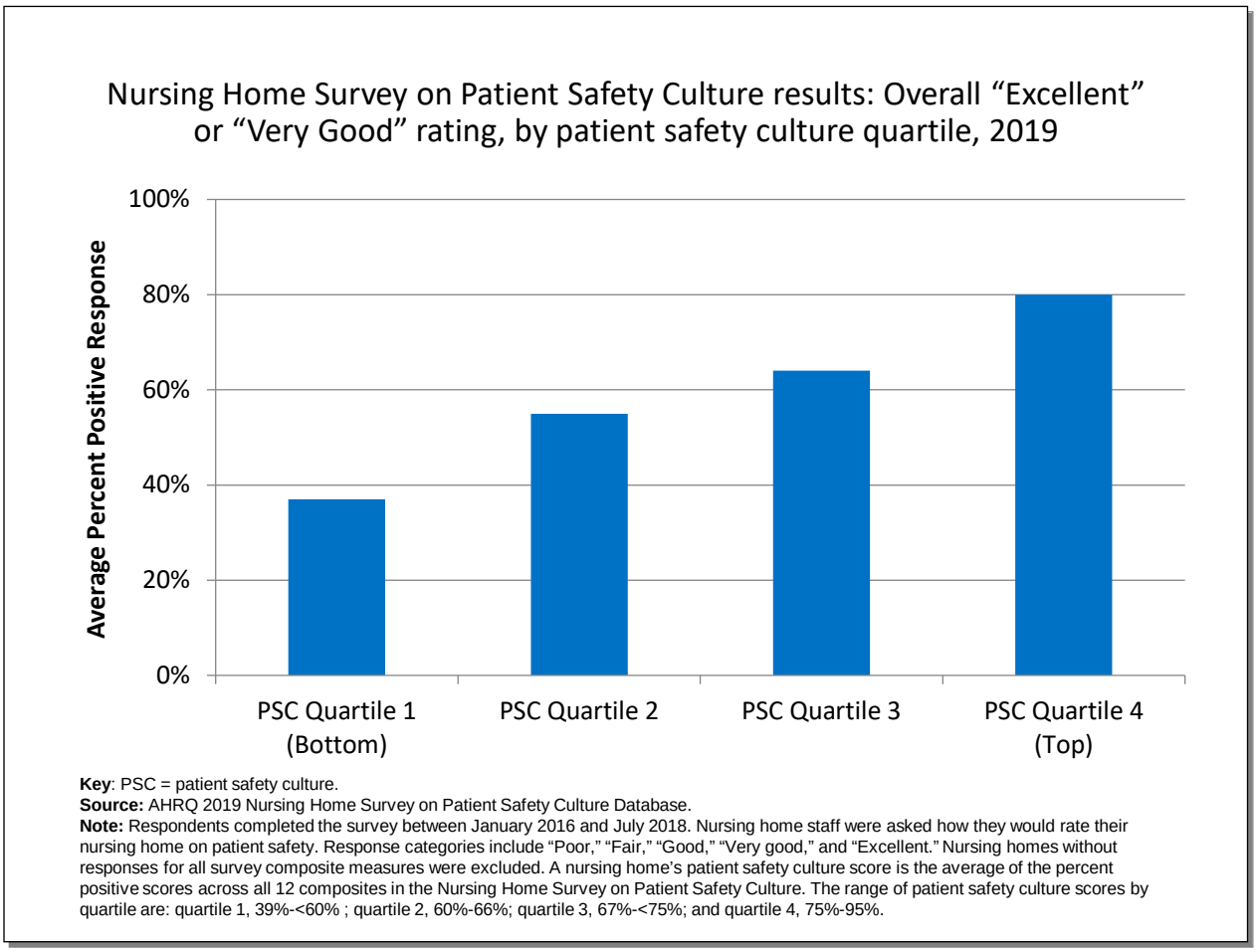
Nursing Home Survey Results on Willingness To Recommend Nursing Home



Key: PSC = patient safety culture.
Source: AHRQ 2019 Nursing Home Survey on Patient Safety Culture Database.
Note: Respondents completed the survey between January 2016 and July 2018. Nursing homes without responses for all survey composite measures were excluded. A nursing home's patient safety culture score is the average of the percent positive scores across all 12 composites in the Nursing Home Survey on Patient Safety Culture. The range of patient safety culture scores by quartile are: quartile 1, 39%-<60% ; quartile 2, 60%-66%; quartile 3, 67%-<75%; and quartile 4, 75%-95%.

- **Importance:** Nursing home staff who are more likely to recommend their nursing home to family members generally perceive that their nursing home has better patient safety culture.
- **Results:**
  - Respondents from nursing homes in the highest patient safety culture quartile (PSC quartile 4) were more likely to recommend their nursing home to family compared with respondents from nursing homes in the lowest quartile (PSC quartile 1).
  - Nursing homes in PSC quartile 4 on average reported 89% of respondents willing to recommend their nursing home compared with 55% in PSC quartile 1.

Nursing Home Survey results on Rating of "Excellent" or "Very Good"



Key: PSC = patient safety culture.
Source: AHRQ 2019 Nursing Home Survey on Patient Safety Culture Database.
Note: Respondents completed the survey between January 2016 and July 2018. Nursing home staff were asked how they would rate their nursing home on patient safety. Response categories include "Poor," "Fair," "Good," "Very good," and "Excellent." Nursing homes without responses for all survey composite measures were excluded. A nursing home's patient safety culture score is the average of the percent positive scores across all 12 composites in the Nursing Home Survey on Patient Safety Culture. The range of patient safety culture scores by quartile are: quartile 1, 39%-<60% ; quartile 2, 60%-66%; quartile 3, 67%-<75%; and quartile 4, 75%-95%.

- **Importance**: The nursing home overall rating on patient safety reflects nursing home respondent perceptions of how well they are doing in general.
- **Results:**
  - Nursing homes in the highest patient safety culture quartile (PSC quartile 4) had a higher average percent positive overall rating of "Excellent" or "Very good" for their nursing home compared with nursing homes in the lowest quartile (PSC quartile 1).
  - The difference in the average percent positive overall rating on patient safety between PSC quartile 4 and PSC quartile 1 was 43 percentage points (80% vs. 37%).

Community Pharmacy Survey on Patient Safety Culture

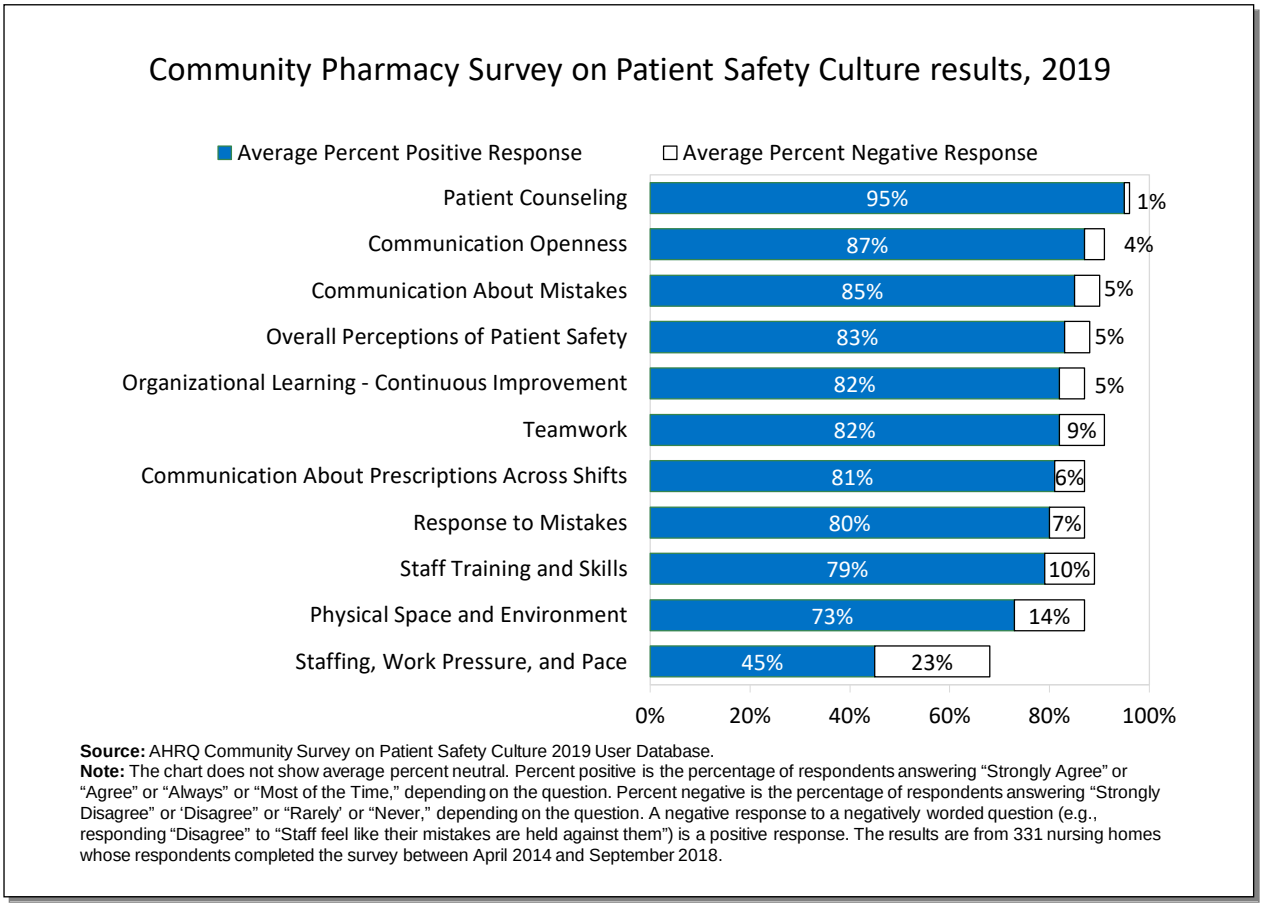
- **Data source:** AHRQ 2019 SOPS Community Pharmacy Database[25]
- **Results provided for:**
  - Documenting mistakes that could have harmed patients and are corrected before the medication leaves the pharmacy, and
  - Overall rating on patient safety in community pharmacies

- **Sample characteristics:**
  - Self-selected sample of U.S. pharmacies, including independents, mass merchants, and parts of chains or healthcare systems
  - Responses submitted between April 2014 and September 2018 from 2,157 staff members representing 331 community pharmacies

The total number of community pharmacies in the United States is 60,084, based on National Community Pharmacists Association data.[26] A pharmacy is defined as a community pharmacy in a specific location. Each pharmacy that is part of a pharmacy chain or healthcare system is considered a separate pharmacy. To be included, pharmacies must be located in the United States or in a U.S. territory. Each pharmacy must have at least five completed surveys. Only current pharmacy employees are eligible to contribute data.

Pharmacies, systems/chains, or survey vendors that have administered the AHRQ *Community Pharmacy Survey on Patient Safety Culture* indicate their interest in participating in the database by registering with AHRQ; interested submitters are notified regarding their eligibility for participation. More information on the survey is available at https://www.ahrq.gov/sops/databases/pharmacy/submission.html.

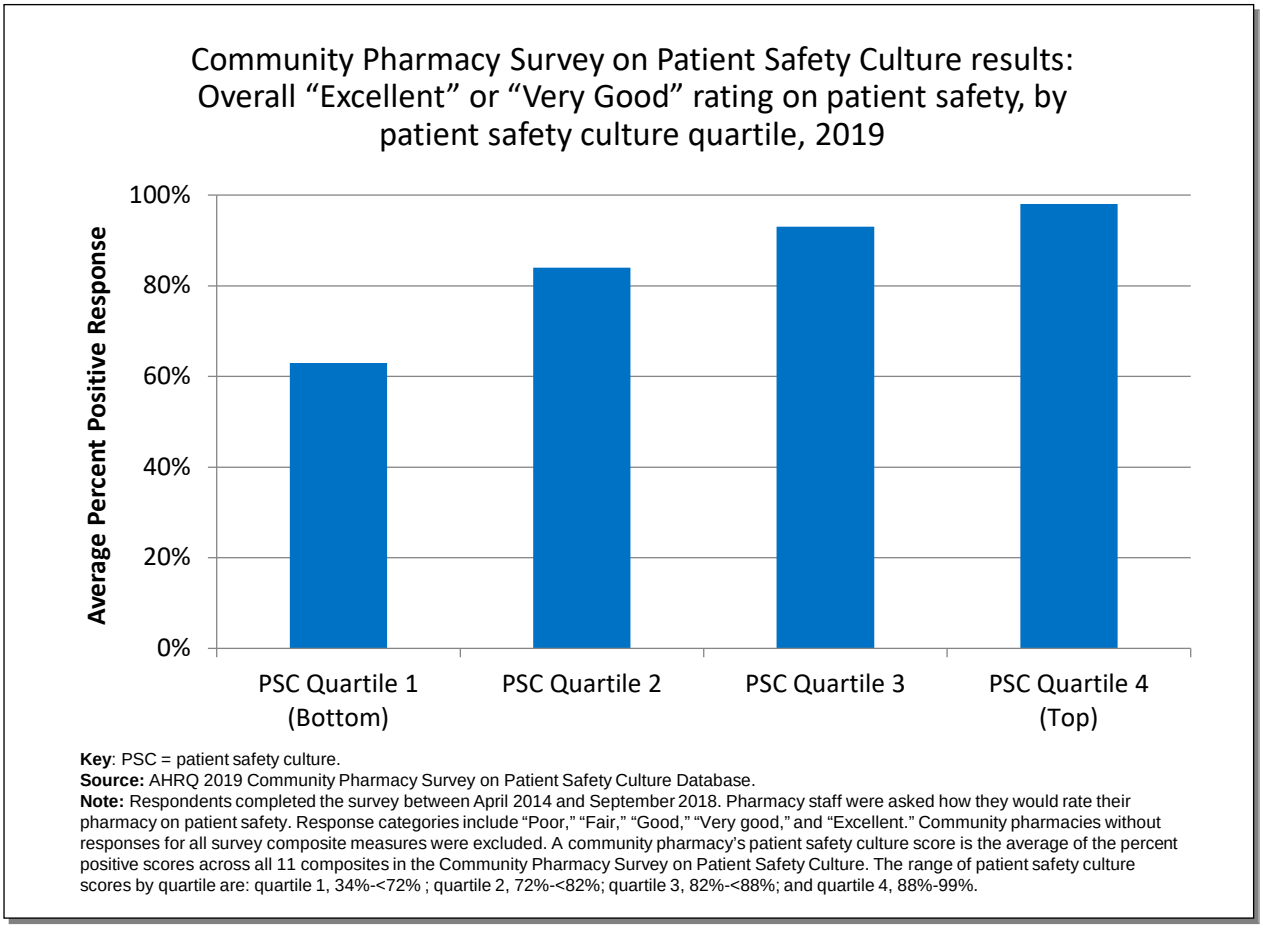
Community Pharmacy Survey Results



Source: AHRQ Community Survey on Patient Safety Culture 2019 User Database.
Note: The chart does not show average percent neutral. Percent positive is the percentage of respondents answering "Strongly Agree" or "Agree" or "Always" or "Most of the Time," depending on the question. Percent negative is the percentage of respondents answering "Strongly Disagree" or 'Disagree" or "Rarely' or "Never," depending on the question. A negative response to a negatively worded question (e.g., responding "Disagree" to "Staff feel like their mistakes are held against them") is a positive response. The results are from 331 nursing homes whose respondents completed the survey between April 2014 and September 2018.

- **Importance**: As community pharmacies aim to improve their performance, there is growing recognition of the importance of establishing a culture of patient safety by looking at patient safety culture areas where they are most positive and where they are perceived most negative by community pharmacy staff.
- **Areas of Strength and Weakness:**
  - Patient Counseling (95%) had the highest average percent positive responses.
  - Staffing, Work Pressure, and Pace (23%) had the highest average percent negative responses.

Community Pharmacy Survey Results on Rating of "Excellent" or "Very Good"



Key: PSC = patient safety culture.
Source: AHRQ 2019 Community Pharmacy Survey on Patient Safety Culture Database.
Note: Respondents completed the survey between April 2014 and September 2018. Pharmacy staff were asked how they would rate their pharmacy on patient safety. Response categories include "Poor," "Fair," "Good," "Very good," and "Excellent." Community pharmacies without responses for all survey composite measures were excluded. A community pharmacy's patient safety culture score is the average of the percent positive scores across all 11 composites in the Community Pharmacy Survey on Patient Safety Culture. The range of patient safety culture scores by quartile are: quartile 1, 34%-<72% ; quartile 2, 72%-<82%; quartile 3, 82%-<88%; and quartile 4, 88%-99%.

- **Importance**: Community pharmacies with an overall rating of "Excellent" or "Very good" on patient safety also have more positive perceptions of how well they are doing in general.
- **Results:**
  - An overall rating on patient safety of "Excellent" or "Very good" was higher among respondents in community pharmacies with higher patient safety culture scores (PSC quartile 4) compared to community pharmacies with lower patient safety culture scores (PSC quartile 1).

- The difference in the average percent positive score on the overall patient safety rating in community pharmacies with the lowest patient safety culture scores compared to community pharmacies with the highest patient safety culture scores was 35 percentage points.

Patient Safety Organization Program

The PSO Program was created by the Patient Safety and Quality Improvement Act of 2005 and implemented by the Agency for Healthcare Research and Quality. PSOs engage with healthcare providers in patient safety and healthcare quality improvement activities. PSOs help providers:

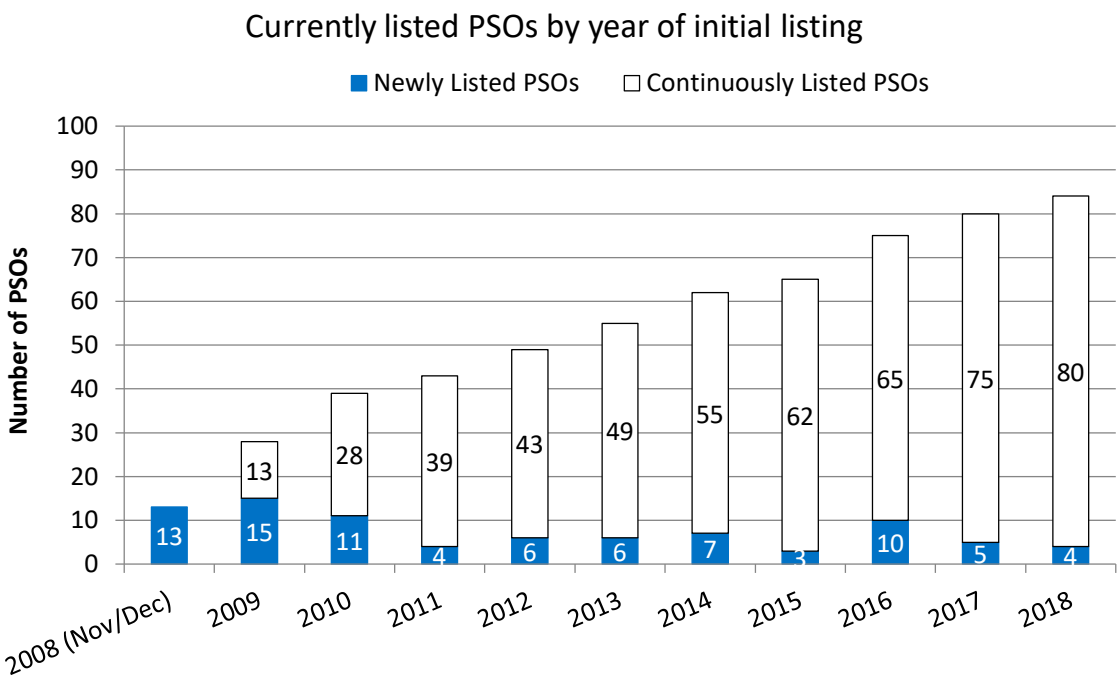
- Assess patient safety culture.
- Maintain and promote privacy and confidentiality.
- Offer collaborative initiatives, education, and training to improve patient safety culture.

Working with a Patient Safety Organization (PSO) gives providers many benefits, which are evidenced by stories from the field showing improved safety. When a provider works with a PSO, many of the following long-recognized impediments to successful improvement projects can be overcome:

- **Provider fear of increased liability from participating in quality initiatives:** The law provides confidentiality protections and privilege protections (inability to introduce the protected information in a legal proceeding) when certain requirements are met.
- **Inability of all licensed or certified healthcare facilities and clinicians to participate:** Unlike State protections that often target hospitals or physicians, these protections are broad.
- **Lack of nationwide and uniform protections:** These protections are especially valuable for systems with facilities in multiple States; a corporate system can share its protected data systemwide with all of its affiliated providers if it chooses to do so.
- **Insufficient volume:** Patient safety events are often too rare for a facility to identify causal factors with certainty. Each provider benefits from the insights it can obtain from a PSO that aggregates large volumes of event data from multiple providers. Moreover, their data remain protected even when the PSO aggregates them with data from other providers.
- **Inability to protect deliberations or analyses at a facility:** The law permits providers to undertake deliberations and analyses at their facilities that become protected as patient safety work product immediately as long as they are conducted in the provider's Patient Safety Evaluation System.

The Patient Safety and Quality Improvement Act of 2005 is available at https://pso.ahrq.gov/legislation. More information on how to become a Patient Safety Organization is available at https://pso.ahrq.gov/become_PSO.

Current Patient Safety Organizations



Source: PSO Privacy Protection Center (PSOPPC) analysis of AHRQ-listed PSO listing dates.

- **Importance:** The PSO program is growing over time, and most participating PSOs remain continuously listed since their initial listing dates. This continuity allows the PSOs to work closely with contracted providers to support quality and safety activities to fulfill eight required patient safety activities:

  - Efforts to improve patient safety and the quality of healthcare delivery
  - Collection and analysis of patient safety work product
  - Development and dissemination of information with respect to improving patient safety, such as recommendations, protocols, and information regarding best practices
  - Utilization of patient safety work product for the purposes of encouraging a culture of safety and providing feedback and assistance to effectively minimize patient risk
  - Maintenance of procedures to preserve confidentiality with respect to patient safety work product
  - Provision of appropriate security measures with respect to patient safety work product
  - Use of qualified staff
  - Activities related to the operation of a patient safety evaluation system and provision of feedback to participants in a patient safety evaluation system

Most Frequent PSO Specialties Reported on the 2018 PSO Profile

PSO Specialty	Frequency	Percentage
All Medical Specialties	36	15%
Anesthesiology	12	5%
Pharmacy	11	5%
Pediatrics	9	4%
Emergency Medicine/EMS	8	3%
General Surgery	8	3%
Radiology	8	3%
Other	17	7%

Source: PSOPPC analysis of 2018 AHRQ PSO Profile data.
Note: Seventy PSOs reported specialty focus in the 2018 PSO Profile. A PSO can report more than one specialty focus.

PSO specialties cover the full spectrum of medical specialties, with more than half (36/70) of PSOs providing data reporting working with all medical specialties. PSOs may report more than one specialty. The table indicates the percentage of responses falling into each category and represents 45 percent of the responses by PSOs to this question.

The following PSO specialties are available in the 2018 PSO Profile:

- All medical specialties
- Anesthesiology
- Cardiology
- Colorectal surgery
- Dentistry
- Dermatology
- Emergency medicine/EMS
- Family medicine
- Gastroenterology
- General surgery
- Internal medicine
- Neurology
- Neurological surgery
- Nuclear medicine
- Nursing
- Obstetrics/Gynecology
- Ophthalmology
- Orthopedic surgery
- Otolaryngology
- Pathology
- Pediatrics
- Pediatric surgery
- Pharmacy
- Physical medicine and rehabilitation
- Plastic surgery
- Podiatry
- Psychiatry
- Pulmonology
- Radiology
- Thoracic surgery
- Urology
- Vascular surgery
- Allied health professionals

Trend of Providers Contracted With PSOs, by Provider Type, 2015-2018

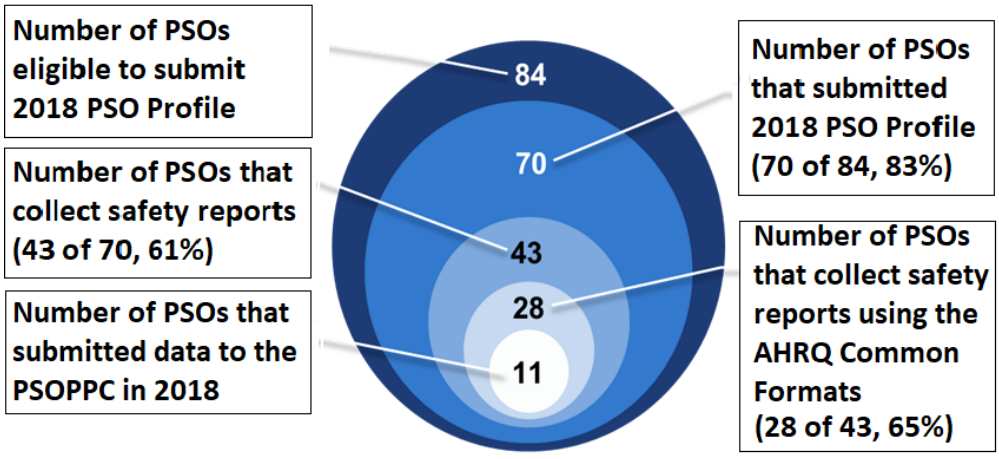
Provider Type	2015 (N = 5,065)	2016 (N = 3,911)	2017 (N = 4,678)	2018 (N = 5,088)
General Hospitals	1,553 (30.7%)	2,011 (51.4%)	2,349 (50.2%)	2,001 (39.3%)
Specialty Hospitals	359 (7.1%)	386 (9.9%)	413 (8.8%)	520 (10.2%)
Critical Access Hospitals	43 (0.8%)	100 (2.6%)	183 (3.9%)	157 (3.1%)
Licensed Practitioner Groups	169 (3.3%)	493 (12.6%)	540 (11.5%)	1,610 (31.6%)
Specialized Treatment Facilities (e.g., Behavioral, Chemotherapy, Dialysis, Psychiatric)	1,956 (38.6%)	31 (0.8%)	69 (1.5%)	69 (1.4%)
Long-Term Care (includes Skilled Nursing Facilities or Intermediate/Long-Term Care Facilities, and Assisted Living Facilities)	31 (0.6%)	166 (4.2%)	136 (2.9%)	77 (1.5%)
Retail Pharmacy	168 (3.3%)	2 (0.1%)	5 (0.1%)	15 (0.3%)
Other*	786 (15.5%)	722 (18.5%)	983 (21%)	639 (12.6%)

* Other includes all categories not specifically identified above (e.g., Urgent care/emergency medicine)
Source: PSOPPC analysis of 2018 AHRQ PSO Profile data.
Note: Forty-five PSOs reported provider type details in the 2018 PSO Profile. Percentages may not add to 100 due to rounding.

While the PSO program continues to have a strong presence working with hospital providers, the providers contracted with PSOs span a large portion of the continuum of care. The trend presents the diversity of the types of providers that are contracted with the PSOs and shows that the patient safety events reported are not limited to those that occur in a hospital setting.

Changes in the number of providers within each type occur for several reasons, including listing of new PSOs, delisting of PSOs no longer participating in the program, and changes in the composition of provider types among contracted providers.

PSO Data Collection and Submission

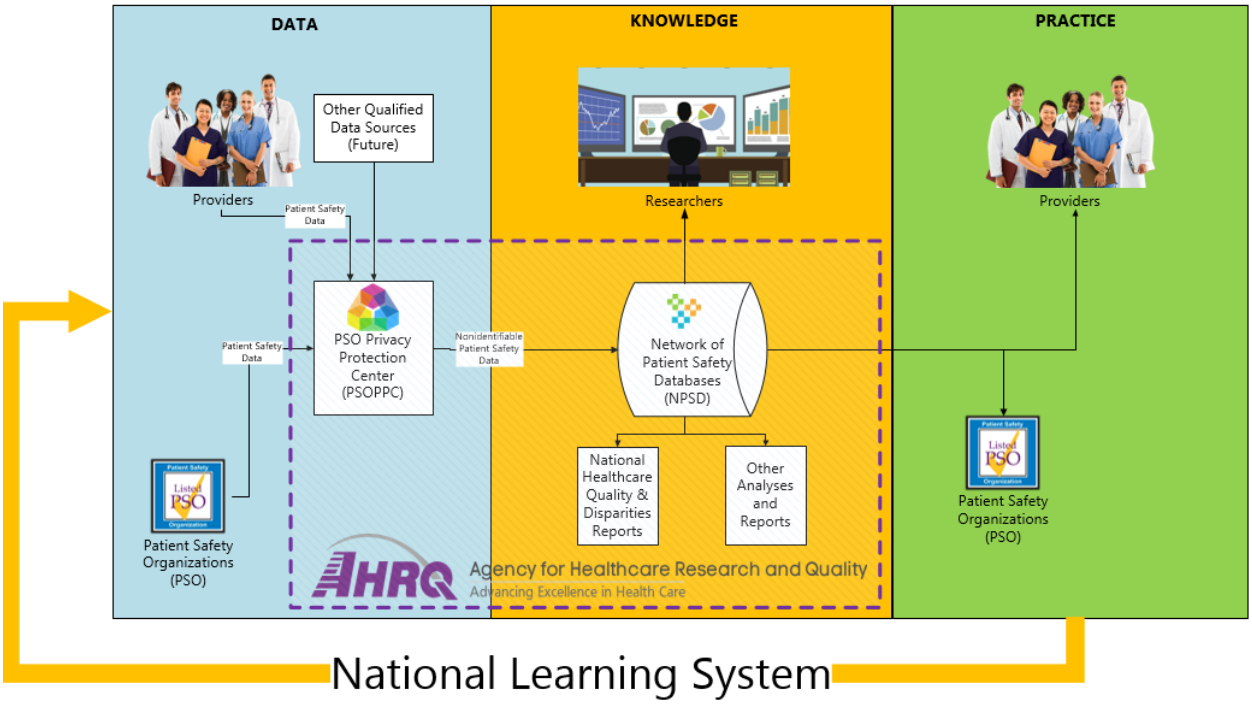


Source: PSOPPC analysis of 2018 AHRQ PSO Profile data.
Note: As of calendar year 2018, the PSOPPC dataset includes data submitted by 17 PSOs across Common Formats for Event Reporting-Hospital V1.1, V1.2, and V2.0.

Seventeen PSOs have submitted data at any time across the Common Formats for Event Reporting-Hospital (CFER-H) V1.1, V1.2, and V2.0. Eleven PSOs submitted data to the PSOPPC during calendar year 2018.

For data to be accepted by the PSOPPC, the data must comply with CFER-H. Although only a small percentage of PSOs submit the data to the PSOPPC using the CFER-H specifications, more than 60% of PSOs collect patient safety reports. These data indicate that opportunities remain to improve the collection and reporting of patient safety data.

Network of Patient Safety Databases and the National Learning System



The Network of Patient Safety Databases (NPSD) is part of the national learning system of providers, the Agency for Healthcare Research and Quality (AHRQ), and AHRQ-listed Patient Safety Organizations (PSOs). The data collected by the Patient Safety Organization Privacy Protection Center (PSOPPC) are designed to support measurement and improvement of patient safety in hospitals. Once the data are collected, aggregated, deidentified, and submitted to the NPSD, they will provide insights about improvements in patient care, which in turn will advance patient safety.

NPSD Data Access

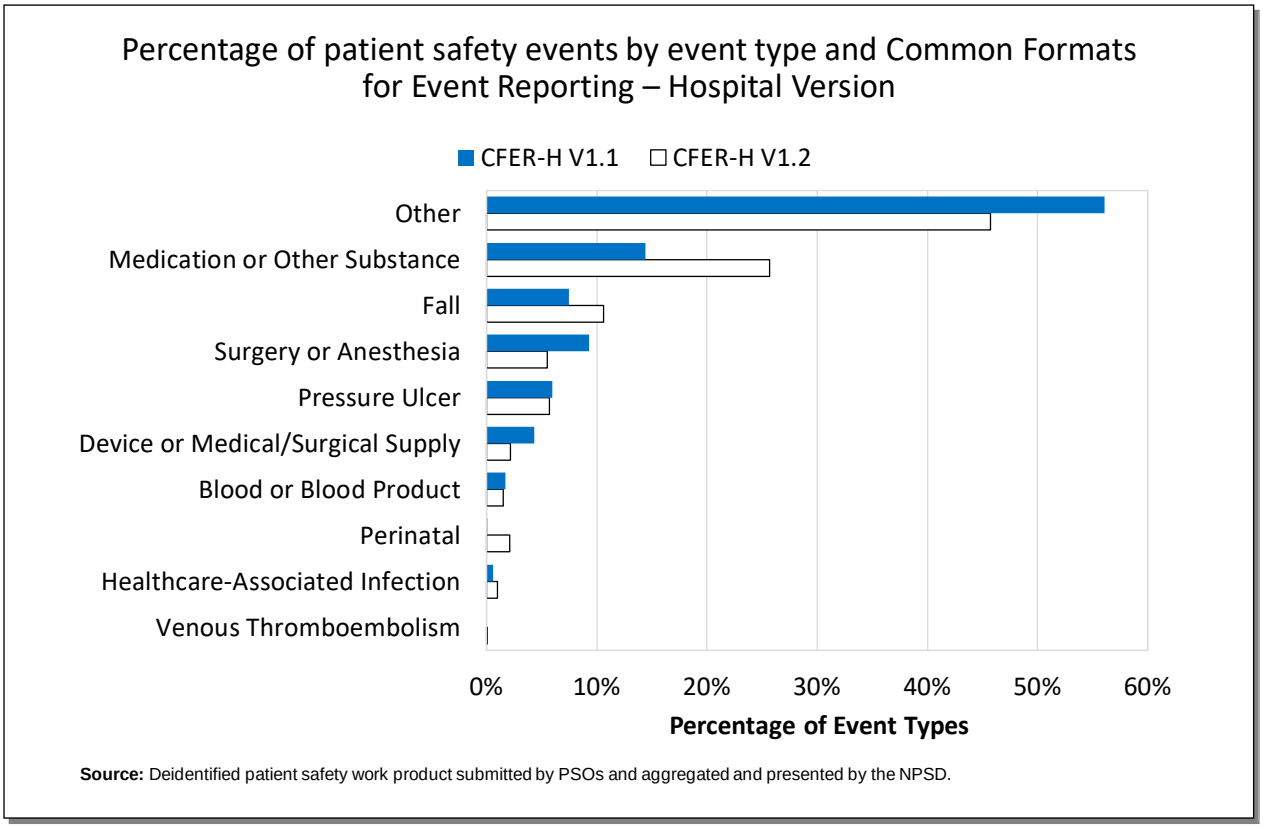
The NPSD contains nonidentifiable data derived from patient safety work product submitted by PSOs. The NPSD contributes to national learning purposes by:

- Visualizing trends and patterns in patient safety concerns.[i]
- Aggregating patient safety data to identify trends and patterns in risks and hazards associated with quality and safety.
- Accelerating the pace by which our knowledge of quality and patient safety solutions advances.

The NPSD dashboards present the most recent data released (https://www.ahrq.gov/npsd/data/dashboard/index.html).

The NPSD makes available aggregated and nonidentifiable data based on the AHRQ Common Formats for Event Reporting, a rich data source for understanding the contexts and contributing factors to patient safety concerns. An immediate goal for AHRQ is to encourage voluntary reporting of information that could be used for national learning to improve patient safety and prevent harm. The NPSD home page is located at https://www.ahrq.gov/npsd/index.html.

Percentage of Patient Safety Events by Common Formats Version



Source: Deidentified patient safety work product submitted by PSOs and aggregated and presented by the NPSD.

[i] Patient safety concerns is a term that encompasses patient safety incidents (where a patient safety event reaches a patient), near-misses (close calls), and unsafe conditions.

The NPSD presents data submitted by PSOs and formatted to the standards set by the AHRQ Common Formats for Event Reporting – Hospital (CFER-H) versions 1.1 and 1.2. The CFER-H data include patient safety concerns for nine specific types of events and a tenth category for *Other* events, intended to be used only for rare events that could not be classified in one of the nine other categories. The fact that *Other* was so widely used, noted in more than half of the reports submitted in CFER-H V1.1, is believed to be an artifact of the mapping strategies of the providers as they move toward integrating Common Formats reporting with their existing data systems.

The relative volume of patient safety events presented by the NPSD differs from more nationally representative data sources such as AHRQ Medicare Patient Safety Monitoring System data. These differences occur because the CFER-H data are voluntarily reported by PSOs and their contracted providers. Providers may choose to submit data for specific types of patient safety concerns or to submit a subset of all events that occurred for a given provider.

AHRQ is aware that healthcare-associated infection (HAI) reporting using the Centers for Disease Control and Prevention's (CDC) National Healthcare Safety Network (NHSN) is required by the Centers for Medicare & Medicaid services (CMS) and many States. Also, PSOs have indicated that almost all providers are using NHSN to report and track HAIs. The low number of HAI reports received reflects the fact that reporting of HAIs through the CFER-H would be redundant at this time.

References

1. Agency for Healthcare Research and Quality. Health Care-Associated Infections. https://psnet.ahrq.gov/primers/primer/7. Last updated January 2019. Accessed September 26, 2019.
2. Magill SS, O'Leary E, Janelle SJ, et al. Changes in prevalence of health care-associated infections in U.S. hospitals. N Engl J Med 2018 Nov 1;379(18):1732-44. https://www.nejm.org/doi/full/10.1056/NEJMoa1801550. Accessed September 26, 2019.
3. Bloodstream Infection Event (Central Line-Associated Bloodstream Infection and Non-Central Line-Associated Bloodstream Infection. Device-Associated Module. Atlanta, GA: Centers for Disease Control and Prevention; January 2019. https://www.cdc.gov/nhsn/pdfs/pscmanual/4psc_clabscurrent.pdf. Accessed September 26, 2019.
4. Urinary Tract Infections (Catheter-Associated Urinary Tract Infection [CAUTI] and Non-Catheter-Associated Urinary Tract Infection [UTI]) and Other Urinary System Infection [USI]) Events. Device-Associated Module. Atlanta, GA: Centers for Disease Control and Prevention; 2019. http://www.cdc.gov/nhsn/pdfs/pscmanual/7psccauticurrent.pdf. Accessed September 26, 2019.
5. Magill SS, Edwards JR, Bamberg W, et al. Multistate point-prevalence survey of health care-associated infections. N Engl J Med 2014;370:1198-1208. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4648343/. Accessed September 26, 2019.
6. Dudeck MA, Edwards JR, Allen-Bridson K, et al. National Healthcare Safety Network (NHSN) report, data summary for 2013, device-associated module. Am J Infect Control 2015 Mar 1;43(3):206-21. Epub 2015 Jan 6. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4653815/. Accessed September 26, 2019.
7. Steiner CA, Karaca Z, Moore BJ, et al. Surgeries in Hospital-Based Ambulatory Surgery and Hospital Inpatient Settings, 2014. HCUP Statistical Brief Number 223. Rockville, MD: Agency for Healthcare Research and Quality; May 2017. www.hcup-us.ahrq.gov/reports/statbriefs/sb223-Ambulatory-Inpatient-Surgeries-2014.pdf. Accessed September 26, 2019.
8. Sunshine JE, Meo N, Kassebaum NJ, et al. Association of adverse effects of medical treatment with mortality in the United States: a secondary analysis of the Global Burden of Diseases, Injuries, and Risk Factors Study. JAMA Netw Open 2019;2(1):e187041. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6484545/. Accessed September 26, 2019.Making Health Care Safer II: An Updated Critical Analysis of the Evidence for Patient Safety Practices. Evidence Reports/Technology Assessments, No. 211. Rockville, MD: Agency for Healthcare Research and Quality; March 2013. AHRQ Publication No. 13-E001-EF. https://www.ncbi.nlm.nih.gov/books/NBK133363/. Accessed September 26, 2019.
9. Making Health Care Safer II: An Updated Critical Analysis of the Evidence for Patient Safety Practices. Evidence Reports/Technology Assessments, No. 211. Rockville, MD: Agency for Healthcare Research and Quality; March 2013. AHRQ Publication No. 13-E001-EF. https://www.ncbi.nlm.nih.gov/books/NBK133363/. Accessed September 12, 2019.
10. Centers for Disease Control and Prevention. National Hospital Discharge Survey: 2010 Table, Procedures by Selected Patient Characteristics - Number by Procedure Category and Age. Atlanta, GA: CDC; 2010. http://www.cdc.gov/nchs/nhds/nhds_tables.htm. Accessed September 26, 2019.
11. Hall, MJ, Schwartzman A, Zhang J. Ambulatory Surgery Data From Hospitals and Ambulatory Surgery Centers: United States, 2010. National Health Statistics Report Number 102. Hyattsville, MD: National Center for Health Statistics; February 2017. https://www.cdc.gov/nchs/data/nhsr/nhsr102.pdf. Accessed September 26, 2019.
12. Fingar KR, Stocks C, Weiss AJ, et al. Most Frequent Operating Room Procedures Performed in U.S. Hospitals, 2003-2012. HCUP Statistical Brief Number 186. Rockville, MD: Agency for Healthcare Research and Quality; December 2014. http://www.hcup-us.ahrq.gov/reports/statbriefs/sb186-Operating-Room-Procedures-United-States-2012.pdf. Accessed September 26, 2019.
13. Chughtai M, Gwam CU, Mohamed N, et al. The epidemiology and risk factors for postoperative pneumonia. J Clin Med Res 2017;9(6):466-75. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5412519/. Accessed September 26, 2019.
14. Centers for Disease Control and Prevention. Pregnancy Mortality Surveillance System. https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pregnancy-mortality-surveillance-system.htm. Last reviewed June 2019. Accessed September 26, 2019.
15. Fingar KR, Hambrick MM, Heslin KC, et al. Trends and Disparities in Delivery Hospitalizations Involving Severe Maternal Morbidity, 2006-2015. HCUP Statistical Brief Number 243. Rockville, MD: Agency for Healthcare Research and Quality; September 2018. www.hcup-us.ahrq.gov/reports/statbriefs/sb243-Severe-Maternal-Morbidity-Delivery-Trends-Disparities.pdf. Accessed September 26, 2019.

16. Hasan O, Meltzer DO, Shaykevih SA, et al. Hospital readmission in general medicine patients: a prediction model. J Gen Intern Med 2010;25(3):211-9. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2839332/. Accessed September 26, 2019.
17. Rau J. Medicare Eases Readmission Penalties Against Safety-Net Hospitals. Kaiser Health News 2018 Sep 26. https://khn.org/news/medicare-eases-readmissions-penalties-against-safety-net-hospitals/. Accessed September 26, 2019.
18. Institute of Medicine. Preventing Medication Errors. Quality Chasm Series. Washington, DC: National Academies Press; 2007. http://www.nap.edu/catalog/11623/preventing-medication-errors-quality-chasm-series. Accessed September 26, 2019.
19. Lim W. Using low molecular weight heparin in special patient populations. J Thromb Thrombolysis 2010 Feb;29(2):233-40. https://www.ncbi.nlm.nih.gov/pubmed/19902146. Accessed September 26, 2019.
20. Sobieraj DM, Coleman CI, Tongbram V, et al. Comparative effectiveness of low-molecular-weight heparins versus other anticoagulants in major orthopedic surgery: a systematic review and meta-analysis. Pharmacotherapy 2012 Sep;32(9):799-808. https://www.ncbi.nlm.nih.gov/pubmed/22744711. Accessed September 26, 2019.
21. Lobo B. Use of newer anticoagulants in patients with chronic kidney disease. Am J Health Syst Pharm 2007;64(19):2017-26. https://www.ncbi.nlm.nih.gov/pubmed/17893411. Accessed September 26, 2019.
22. Pisoni RL, Zepel L, Port FK, et al. Trends in U.S. vascular access use, patient preferences, and related practices: an update from the U.S. DOPPS practice monitor with international comparisons. Am J Kidney Dis 2015;65(6):905-15. https://www.ncbi.nlm.nih.gov/pubmed/25662834. Accessed September 26, 2019.
23. National Association for Home Care & Hospice. Basic Statistics About Home Care. Updated 2010. http://www.nahc.org/assets/1/7/10hc_stats.pdf. Accessed September 26, 2019.
24. Famolaro T, Yount N, Hare, R, et al. Nursing Home Survey on Patient Safety Culture: 2019 User Database Report. (Prepared by Westat, Rockville, MD, under Contract No. HHSP233201500026I). Rockville, MD: Agency for Healthcare Research and Quality; February 2019b. AHRQ Publication No. 19-0027. https://www.ahrq.gov/sops/databases/nursing-home/index.html. Accessed September 26, 2019.
25. Famolaro T, Yount N, Hare R, et al. Community Pharmacy Survey on Patient Safety Culture: 2019 User Database Report. (Prepared by Westat, Rockville, MD, under Contract No. HHSP233201500026I). Rockville, MD: Agency for Healthcare Research and Quality; April 2019a. AHRQ Publication No. 19-0033-EF. https://www.ahrq.gov/sops/databases/pharmacy/index.html. Accessed September 26, 2019.
26. National Community Pharmacists Association. Digest: Opportunities for Community Pharmacy in a Changing Market. Alexandria, VA: NCPA; 2016. http://www.ncpa.co/pdf/digest/2016/2016-ncpa-digest-spon-cardinal.pdf. Accessed September 26, 2019.